

2006 Buick Lucerne CXS

2006 STEERING Steering Wheel and Column - Lucerne

2006 STEERING

Steering Wheel and Column - Lucerne

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
BTSI Bracket Screws	7 N.m	62 lb in
Cable Support Bracket Screws	3.5 N.m	31 lb in
Ignition Lock Cylinder Case Screws	7 N.m	62 lb in
Ignition Switch Assembly Screws	1.5 N.m	13 lb in
Intermediate Shaft Seal Bolts	3 N.m	27 lb in
Intermediate Shaft to the Steering Column Pinch Bolt	47 N.m	35 lb ft
Intermediate Shaft to the Steering Gear Pinch Bolt	47 N.m	35 lb ft
Linear Shift Assembly to Steering Column Mounting Screws	5 N.m	44 lb in
Shift Lever Screw	20 N.m	15 lb ft
Steering Column Lower Mounting Bolts	27 N.m	20 lb ft
Steering Column Trim Cover Lower Nearest Tilt Lever	2 N.m	18 lb in
Steering Column Trim Cover Lower in Center of Shroud	3.5 N.m	31 lb in
Steering Column Trim Cover Upper	1.5 N.m	13 lb in
Steering Column Upper Mounting Bolts	27 N.m	20 lb ft
Steering Wheel Horn Switch Screws	5 N.m	44 lb in
Steering Wheel Nut	41 N.m	30 lb ft
Steering Wheel Rear Bezel Screws	3 N.m	27 lb in
Turn Signal Multifunction Switch Screws Side	7 N.m	62 lb in
Turn Signal Multifunction Switch Screws Top	3 N.m	27 lb in

SCHEMATIC AND ROUTING DIAGRAMS

STEERING WHEEL AND COLUMN SCHEMATIC ICONS

Steering Wheel and Column Schematic Icons

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Icon	Icon Definition
	<p>CAUTION:</p> <p>When performing service on or near the SIR components or the SIR wiring, the SIR system must be disabled. Refer to <u>SIR Disabling and Enabling</u>. Failure to observe the correct procedure could cause deployment of the SIR components, personal injury or unnecessary SIR system repairs.</p>

STEERING WHEEL SCHEMATICS

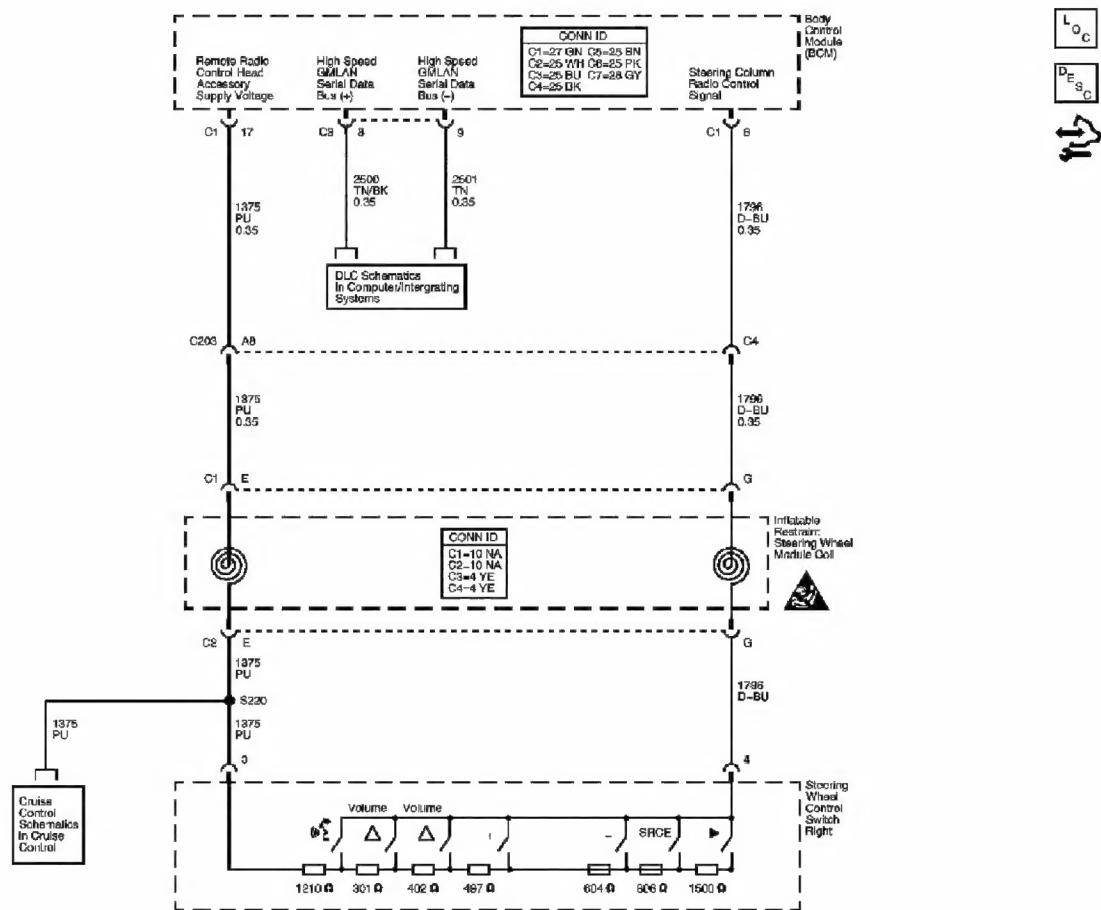


Fig. 1: Redundant Steering Wheel Controls Steering Wheel Schematic

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Courtesy of GENERAL MOTORS CORP.

COMPONENT LOCATOR

STEERING COLUMN DISASSEMBLED VIEW

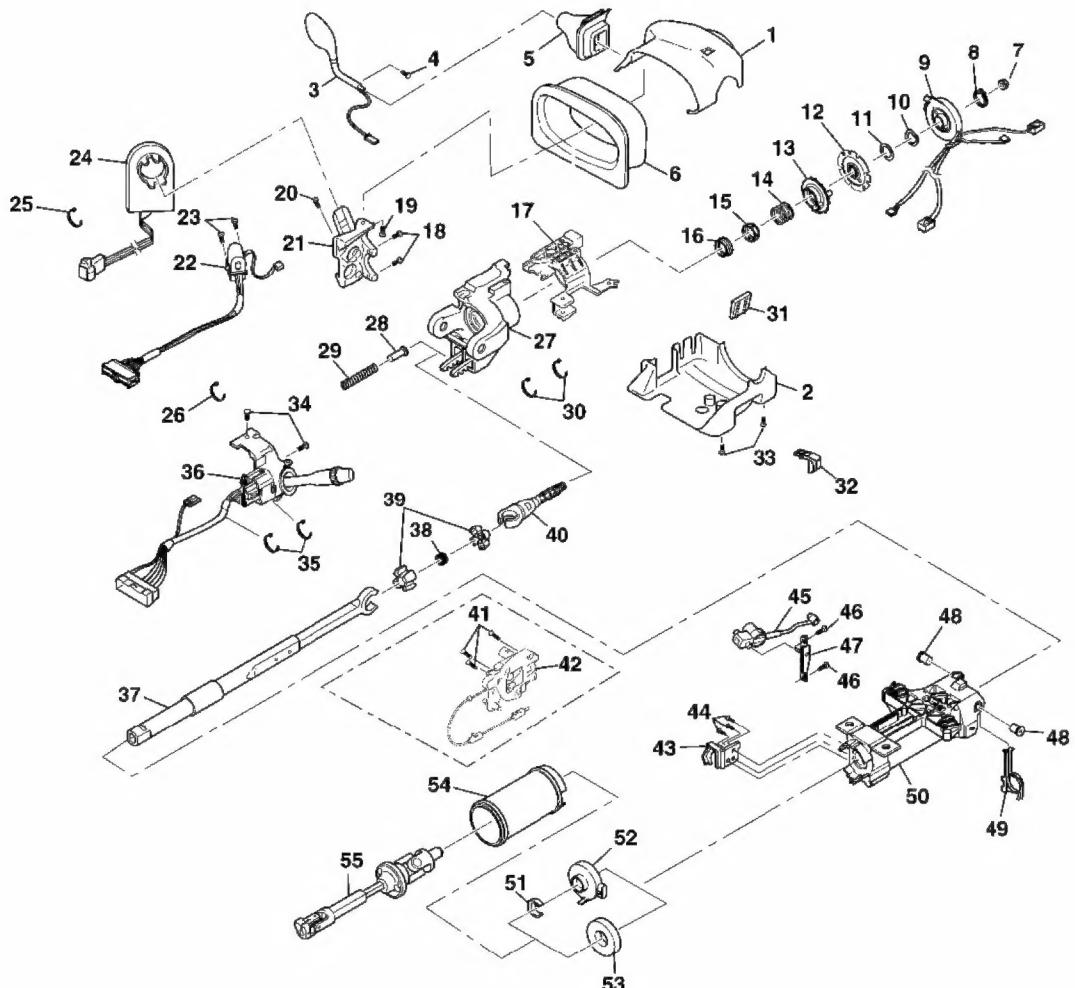


Fig. 2: Steering Column Disassembled View

Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 2

Callout	Component Name
1	Upper Trim Cover
2	Lower Trim Cover
3	Shift Lever Assembly
4	Shift Lever Screw
5	Shift Lever Seal

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Callout	Steering Column Closeout Component Name
7	Upper Trim Ring Nut
8	Retaining Ring Cover
9	SILIC Silver Assembly
10	White Washers Screw
11	Spring Retainer
12	Shaft Lock Shield Assembly
13	Turn Signal Cancel Cam Assembly
14	Upper Bearing Spring
15	Upper Bearing Inner Race Seat
16	Inner Race
17	Signal Switch Housing Assembly
18	Pan Head Tapping Screws
19	TORX® Head Screw
20	Pan Head Tapping Screw
21	Ignition Lock Cylinder Case
22	Ignition Switch Assembly
23	Tapping Screws
24	Theft Deterrent Control Module
25	Wire Harness Strap
26	Wire Harness Strap
27	Steering Column Tilt Head Assembly
28	Spring Guide
29	Tilt Spring
30	Wire Harness Straps
31	Trim Cover Protector
32	Tilt Knob
33	Pan Head Tapping Screws
34	Pan Head Tapping Screws
35	Wire Harness Straps
36	Turn Signal and Multifunction Switch Assembly
37	Lower Steering Shaft Assembly
38	Joint Preload Spring
39	Centering Sphere
40	Race and Upper Shaft Assembly
41	Flat Head 6-Lobed Socket Tapping Screws
42	Linear Shift Shaft Assembly
43	Cable Support Bracket

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8	Retaining Screws
45	Automatic Transmission Shift Lock Control
46	Wave Wash Tapping Screws
47	Automatic Transmission Shift Lock Control Mounting Bracket
12	Assembly Block Shield Assembly
48	Pivot Pins Signal Cancel Cam Assembly
49	Wire Restraint Clip
50	Steering Column Support Assembly
56	Sensor Racecar
57	Steering Shaft Position Sensor Assembly
58	Steering Shaft Tapping Screws
59	Bumper Seal Head Screw
20	Intermediate Steering Shaft Assembly

STEERING WHEEL AND COLUMN COMPONENT VIEWS

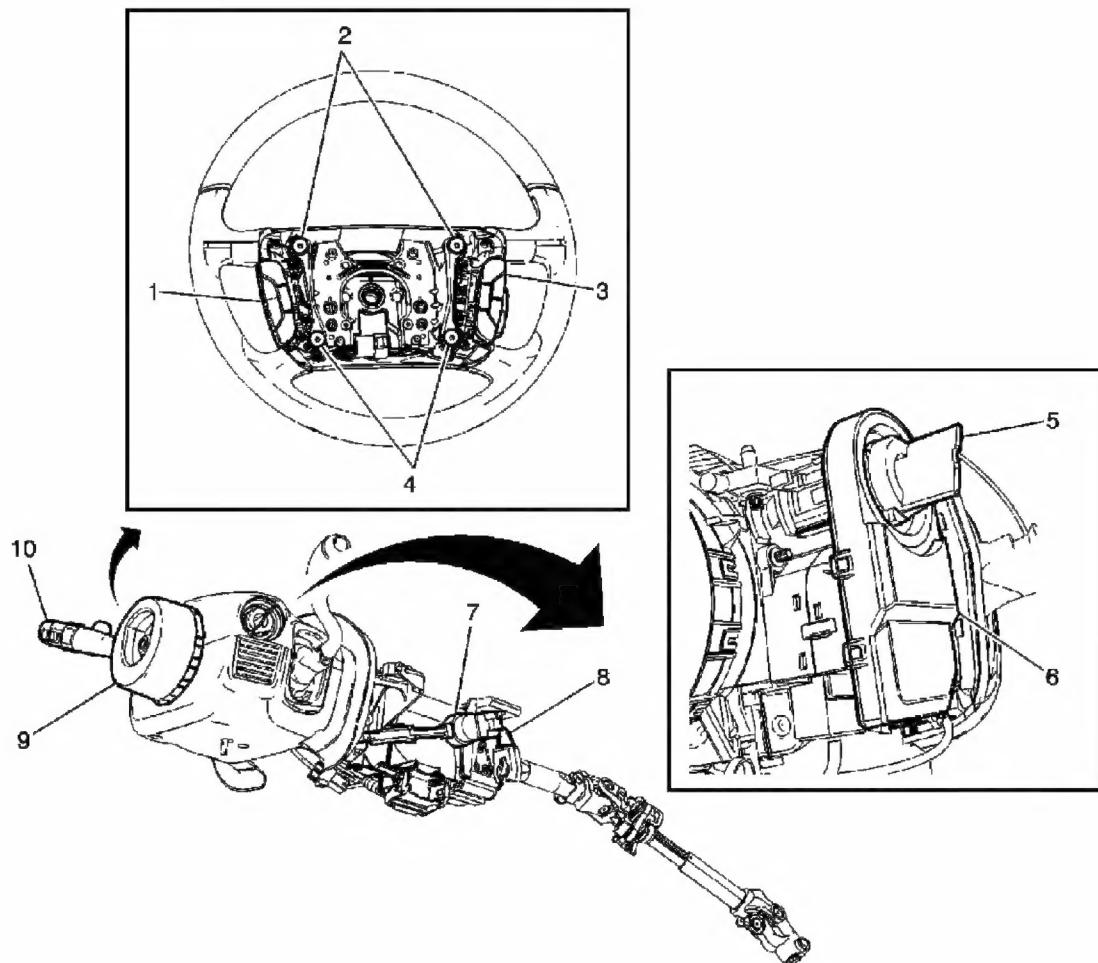


Fig. 3: Identifying Steering Column Components

Courtesy of **GENERAL MOTORS CORP.**

Callouts For Fig. 3

Callout	Component Name
1	Steering Wheel Control Switch - Left
2	Horn Switches
3	Steering Wheel Control Switch - Right
4	Horn Switches
5	Ignition Switch
6	Theft Deterrent Module (TDM)
7	Ignition Lock Cylinder Solenoid (A51)
8	Steering Angle Sensor (JL4)
9	Inflatable Restraint Steering Wheel Module Coil
10	Turn Signal/Multifunction Switch

STEERING WHEEL AND COLUMN CONNECTOR END VIEWS

Steering Wheel Control Switch - Left

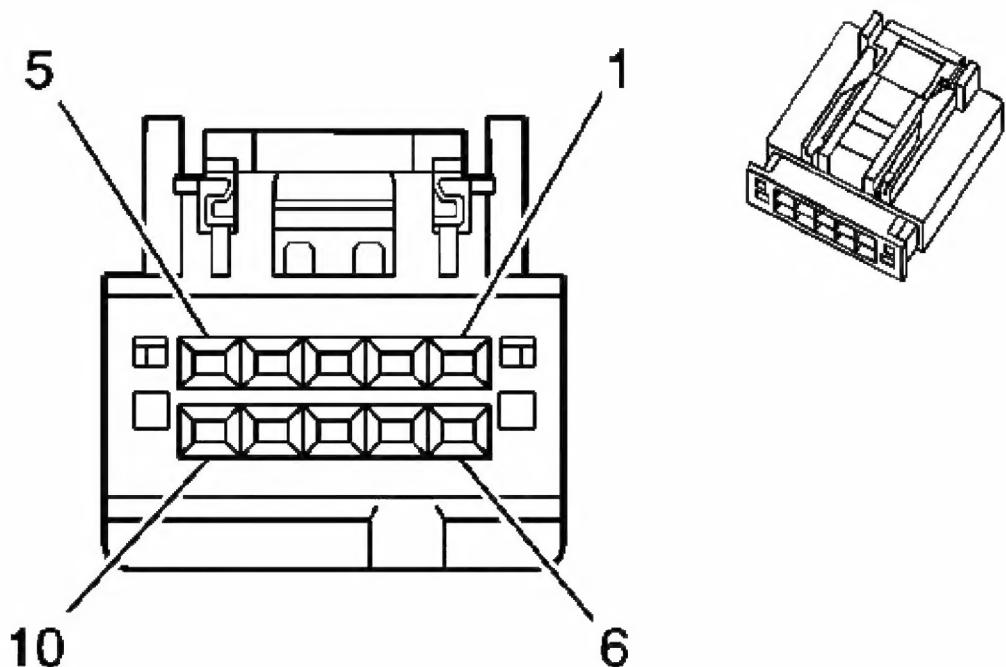


Fig. 4: Steering Wheel Control Switch Connector End View - Left

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Courtesy of **GENERAL MOTORS CORP.**

Steering Wheel and Column Connector End Views

Connector Part Information

- OEM: 30700-1100
- Service: See Catalog
- Description: 10-Way F HDAC64 DR (BK)

Terminal Part Information

- Terminal/Tray: See Terminal Repair Kit
- Core/Insulation Crimp: See Terminal Repair Kit
- Release Tool/Test Probe: See Terminal Repair Kit

Steering Wheel Control Switch - Left

Pin	Wire Color	Circuit No.	Function
1	PU	1375	Remote Radio Control Head Accessory Supply Voltage
2	-	-	Not Used
3	GY	1884	Cruise Control Set/Cruise and Resume/Accelerate Switch Signal
4-5	-	-	Not Used
6	PU/WH	1381	LCD Dimming Signal
7	-	-	Not Used
8	BK	350	Ground
9	D-GN/WH	7158	Cruise Control Indicator Dimming Signal
10	-	-	Not Used

Steering Wheel Control Switch - Right

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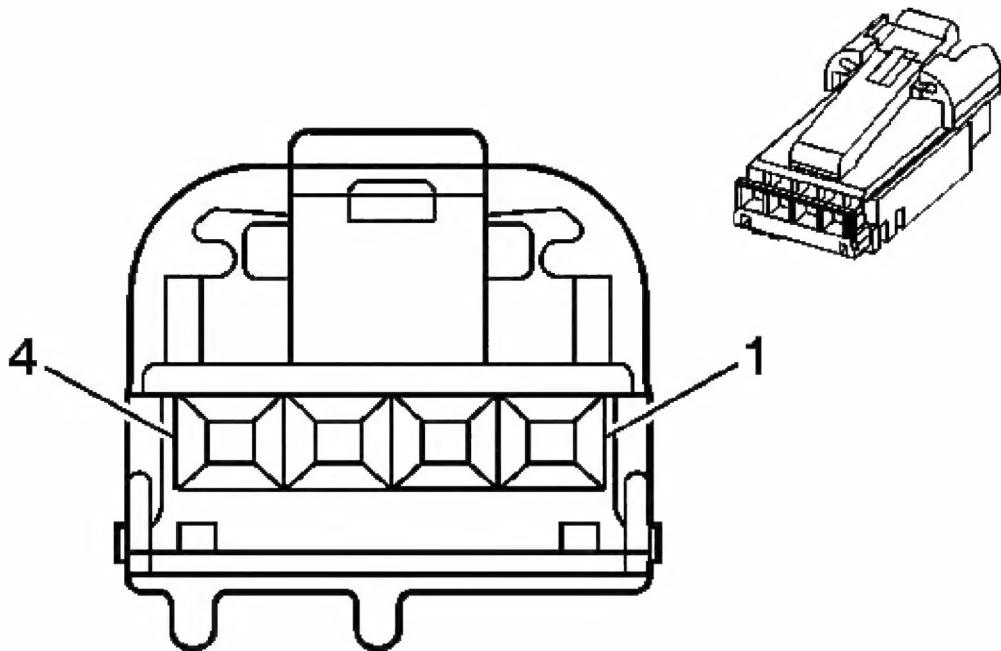


Fig. 5: Steering Wheel Control Switch Connector End View - Right

Courtesy of GENERAL MOTORS CORP.

Steering Wheel and Column Connector End Views

Connector Part Information

- OEM: 31068-1010
- Service: See Catalog
- Description: 4-Way F RECEPTACLE 0.64 BK

Terminal Part Information

- Terminal/Tray: 1393364-2/7
- Core/Insulation Crimp: K/K
- Release Tool/Test Probe: 15315247/J-35616-64B (L-BU)

Steering Wheel Control Switch - Right

Pin	Wire Color	Circuit No.	Function
1	BK	350	Ground

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2	PU/WH	1381	LCD Dimming Signal
3	PU	1375	Remote Radio Control Head Accessory Supply Voltage
4	D-BU	1796	Steering Column Radio Control Signal

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - STEERING WHEEL CONTROLS

Begin the system diagnosis with **Diagnostic System Check - Vehicle**. The Diagnostic System Check - Vehicle will provide the following information:

- The identification of the control modules which command the system
- The ability of the control modules to communicate through the serial data circuit
- The identification of any stored diagnostic trouble codes (DTCs) and their status

The use of the Diagnostic System Check - Vehicle will identify the correct procedure for diagnosing the system and where the procedure is located.

SCAN TOOL DATA LIST

Scan Tool Data List

Scan Tool Parameter	Data List	Units Displayed	Typical Data Value
Operating Conditions: Ignition ON			
SWC Bank 1 Status	Data Display	SW1-SW7	Pressed: SW1-SW7, Released: Idle

SCAN TOOL DATA DEFINITIONS

SWC Bank 1 Status

Indicates the switch pressed SW1-SW7 and Idle when released.

DTC B3622

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.

- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor**DTC B3622 07**

Steering Wheel Controls Signal Circuit

Circuit/System Description

The body control module (BCM) monitors the signal circuit voltage. If the voltage level is too high, damage may result in the system. When a high voltage condition is detected, the BCM will ignore the switch command.

Conditions for Running the DTC

Ignition ON.

Conditions for Setting the DTC

BCM detects voltage above 18.5 volts for 100 msec.

Action Taken When the DTC Sets

BCM will ignore the switch command.

Conditions for Clearing the DTC

- The condition for setting the DTC is no longer present and the DTC is cleared with a scan tool.
- The BCM automatically clears the history DTC when a current DTC is not detected in 100 consecutive ignition cycles.

Diagnostic Aids

Test the charging system. Refer to **Charging System Test**.

STEERING WHEEL CONTROLS INOPERATIVE**Diagnostic Fault Information**

IMPORTANT: Always perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.

Circuit/System Description

The body control module (BCM) supplies voltage to the audio steering wheel control multiple

momentary contact switches and monitors the return signal. Each switch is associated to a set resistance value, when pressed a specific voltage drop occurs through a series of resistors unique to that switch. The BCM identifies the selection, then sends a serial data message that is received by the component controlled, activating the feature.

Diagnostic Aids

- This diagnostic is for the audio steering wheel controls.
- Before diagnosis of the steering wheel controls, ensure the primary controls of the associated component are functioning properly.
- Review schematic when testing switch resistance values.
- If a single switch function is inoperative, test the suspect switch. Refer to **Component Testing**.

Reference Information**Schematic Reference****Steering Wheel Schematics****Connector End View Reference**

- **Steering Wheel and Column Connector End Views**
- **Computer/Integrating Systems Connector End Views**

Description and Operation**Steering Wheel Controls Description and Operation****Electrical Information Reference**

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

Scan Tool Reference

- **Scan Tool Data List**
- **Scan Tool Data Definitions**

Circuit/System Verification

Ignition ON, observe the BCM data display with the scan tool under Inputs-SWC Bank 1 status. Data displays SW1-SW7 identifying the switch pressed and Idle when released.

Circuit/System Testing

CAUTION: Refer to SIR Caution .

1. Ignition OFF, disconnect the harness connector at the audio steering wheel control switch.
2. Ignition ON, test for ignition voltage between the ignition circuit terminal 3 and ground.
 - If less than the specified value, test the ignition circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the BCM.
3. Test for 0 volts between the signal circuit terminal 4 and ground.
 - If greater than the specified value, test the signal circuit for a short to voltage. If the circuit tests normal, replace BCM.
4. Test for ignition voltage between the ignition circuit and the signal circuit.
 - If less than the specified value, test the signal circuit for an open/high resistance. If the circuit tests normal, replace the BCM.
5. Ignition OFF, disconnect the harness connector C1 at the BCM.
6. Test for infinite resistance between the signal circuit terminal 6 and ground.
 - If not the specified value, test the signal circuit for a short to ground. If the circuit tests normal, replace the BCM.
7. If all circuits test normal, test or replace switch.

Component Testing

CAUTION: Refer to SIR Caution .

1. Ignition OFF, disconnect the harness connector at the applicable steering wheel control switch.
2. Test for infinite resistance between the signal terminal 4 and the ignition terminal 3 with the switch in the open position.
 - If not the specified value, replace the switch.
3. Test resistance values between the signal terminal and the ignition terminal with the switch closed in each position. Verify readings are approximate to what the schematic reads.
 - If not the specified value, replace the switch.

Repair Procedures

IMPORTANT: Always perform the Diagnostic Repair Verification after

completing the diagnostic procedure.

- **Steering Wheel Control Switch Assembly Replacement**
- **Control Module References** for BCM replacement, setup and programming

SYMPTOMS - STEERING WHEEL AND COLUMN

Review the system description and operation in order to familiarize yourself with the system functions. Refer to **Steering Wheel and Column Description and Operation**.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the steering wheel and column.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Symptoms List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- **Steering Column Tilt Function Inoperative**
- **Ignition Key Cannot Be Removed from the Ignition Lock Cylinder (Column Shift)** or **Ignition Key Cannot Be Removed from the Ignition Lock Cylinder (Floor Shift)**
- **Ignition Key Cannot Turn or Sticks in Any Position**
- **Noise in Steering Column**
- **High Shift Effort**
- **Looseness in Steering Column**

SYMPTOMS - STEERING WHEEL CONTROLS

IMPORTANT: 1. Perform the **Diagnostic System Check - Vehicle**, before using the Symptom Tables in order to verify that all of the following conditions are true:

- There are no DTCs set.
- The control modules can communicate via the serial data link.

2. Review the system operation in order to familiarize yourself with the system functions. Refer to **Steering**

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Wheel Controls Description and Operation.

Visual/Physical Inspection

- Inspect for aftermarket devices which may affect the operation of the Steering Wheel Controls System. Refer to [Checking Aftermarket Accessories](#).
- Inspect for easily accessible or visible system components for obvious damage or conditions which may cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to [Testing for Intermittent Conditions and Poor Connections](#).

Symptom List

Refer to [Steering Wheel Controls Inoperative](#) in order to diagnose the symptom.

STEERING COLUMN TILT FUNCTION INOPERATIVE

Steering Column Tilt Function Inoperative

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and Operation and perform the necessary inspections?	Go to Step 2	<u>Steering Wheel and Column Description and Operation</u>
2	Verify that the steering column tilt function is inoperative. Does the steering column tilt function operate normally?	System OK	Go to Step 3
3	Verify that the shoe is not seized on the pivot pin. Is the shoe seized on the pivot pin?	Go to Step 9	Go to Step 4
4	Inspect the shoe grooves for dirt, burrs or rust. Are the shoe grooves free of dirt, burrs and rust?	Go to Step 5	Go to Step 9
5	Inspect weak or broken shoe lock spring. Is the shoe lock spring weak or broken?	Go to Step 9	Go to Step 6
6	Inspect the pivot pins for binding. Are the pivot pins binding?	Go to Step 9	Go to Step 7
	Inspect for a weak or broken wheel tilt		

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7	spring. Is the wheel tilt spring weak or broken?	Go to Step 10	Go to Step 8
8	Inspect the steering column wiring harness for tightness. Is the steering column wiring harness too tight?	Go to Step 11	Go to Step 3
9	Replace the pivot pins. Refer to <u>Steering Column Tilt Head Housing Replacement.</u> Is the repair complete?	Go to Step 12	-
10	Replace the tilt spring. Refer to <u>Tilt Spring Replacement.</u> Is the repair complete?	Go to Step 12	-
11	Reroute the steering column wiring harness to the correct location. Is the steering column wiring harness routed properly?	Go to Step 12	-
12	Operate the steering column tilt function in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

IGNITION CAN/CANNOT BE TURNED OFF WITH TRANSMISSION IN ANY GEAR

Circuit Description

If the vehicle is equipped with a floor mounted console gearshift, an ignition lock cylinder control actuator system is used in the steering column. The purpose of the system is to prevent the ignition lock cylinder from being turned to the lock position while the transmission is in gear. This would also prevent the steering wheel from being locked. The system consists of an ignition lock cylinder actuator and a park position switch. The actuator contains a pin that is spring loaded out, to prevent the ignition lock cylinder from being turned to the lock position when the gearshift is not in PARK. The park position switch is located in the floor mounted gearshift assembly, as part of the automatic transmission shift lock control switch. The switch is closed with the gearshift in PARK and open in all other positions

System Operation

When the gearshift is in the PARK position, the park position switch is closed. This applies voltage to the ignition lock cylinder actuator and the pin retracts, allowing the ignition lock cylinder to be turned to the LOCK position. When the gearshift is not in PARK, the park position switch is open. No voltage is applied to the ignition lock cylinder actuator and the spring loaded pin remains in the out position, preventing the ignition lock cylinder from being turned to LOCK. If vehicle power is lost while the ignition lock cylinder is not in the LOCK

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position, the system will prevent the operator from turning the ignition key to the lock position or removing the key. If the vehicle has lost power, pushing the ignition lock cylinder release button on the underside of the ignition lock cylinder will override the system and allow the key to be removed.

Ignition Can/Cannot Be Turned Off with Transmission in Any Gear

Step	Action	Yes	No
Schematic Reference: Steering Wheel Schematics			
Connector End View Reference: Steering Wheel and Column Connector End Views			
1	Verify the fault is present. Does the system operate normally?	Go to <u>Testing for Intermittent Conditions and Poor Connections</u>	Go to Step 2
2	Does the automatic transaxle shift lever operate normally?	Go to Step 3	Go to <u>Diagnostic Starting Point - Automatic Transmission Shift Lock Control</u>
3	<ol style="list-style-type: none">Push the ignition lock cylinder control actuator release button which is on the underside of the ignition lock cylinder.Turn the key to the LOCK position and remove the key. Were you able to turn the key to the LOCK position and remove the key?	Go to Step 4	Go to <u>Ignition Key Cannot Be Removed from the Ignition Lock Cylinder (Column Shift)</u> or <u>Ignition Key Cannot Be Removed from the Ignition Lock Cylinder (Floor Shift)</u>
	<ol style="list-style-type: none">Turn OFF the ignition.Disconnect the ignition lock cylinder control actuator.Connect a test lamp between the battery positive voltage and ground circuits of the ignition lock		

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	cylinder control actuator.		
4	4. Turn ON the ignition, with the engine OFF. 5. Cycle the gear shift from Park to Drive. Does the test lamp turn ON and OFF with each cycle?		Go to Step 11
5	Does the test lamp remain illuminated with each cycle?	Go to Step 8	Go to Step 6
6	Probe the ground circuit of the ignition lock cylinder control actuator with a test lamp connected to battery voltage. Does the test lamp illuminate?	Go to Step 7	Go to Step 9
7	Test the control circuit of the ignition lock cylinder control actuator for an open. Refer to <u>Circuit Testing</u> and to <u>Wiring Repairs</u> . Did you find and correct the condition?		Go to Step 14
8	Test the control circuit of the ignition lock cylinder control actuator for a short to voltage. Refer to <u>Circuit Testing</u> and to <u>Wiring Repairs</u> . Did you find and correct the condition?	Go to Step 14	Go to Step 10
9	Repair the open in the ground circuit of the ignition lock cylinder control actuator. Refer to <u>Wiring Repairs</u> . Did you complete the repair?	Go to Step 14	-
10	Inspect for poor connections at the automatic transmission shift lock actuator. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and <u>Connector Repairs</u> . Did you find and correct the condition?	Go to Step 14	Go to Step 12
11	Inspect for poor connections at the ignition lock cylinder control actuator. Refer to <u>Testing for Intermittent Conditions and Poor Connections</u> and to <u>Connector Repairs</u> . Did you find and correct the condition?	Go to Step 14	Go to Step 13
	Replace the automatic transmission shift		

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Step	Action	Yes	No
Schematic Connector	Transmission Shift Lever Characteristics Review Reference: Steering Wheel and Column Connector End View		
12	Did you complete the replacement? Verify the fault is present.	Go to Step 14 Go to Testing	-
13	Replace the ignition lock cylinder? control actuator. Refer to <u>Ignition Lock Cylinder Solenoid Replacement</u> . Did you complete the replacement?	for Intermittent Conditions and Poor Connections	Go to Step 2
14	Operate the system in order to verify the repair normally? Did you correct the condition?	System OK	Go to Diagnostic Starting Point

IGNITION KEY CANNOT BE REMOVED FROM THE IGNITION LOCK CYLINDER (COLUMN SHIFT)

Ignition Key Cannot Be Removed from the Ignition Lock Cylinder (Column Shift)

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and Operation and perform the necessary inspections?	Go to Step 2	Go to <u>Steering Wheel and Column Description and Operation</u>
2	Verify the key cannot be removed from the ignition lock cylinder. Is the key stuck in the lock cylinder?	Go to Step 3	System OK
3	Is the vehicle equipped with a manual transmission?	Go to Step 7	Go to Step 4
4	Turn the ignition key to the OFF position. Can the key be turned to the OFF position and be removed?	Go to Step 7	Go to Step 5
5	Verify the adjustment of the automatic transmission cable. Refer to <u>Range Selector Lever Cable Adjustment</u> and <u>Range Selector Lever Cable Adjustment</u> . Can the key be turned to the OFF position?	System OK	Go to Step 6
6	Inspect the linear shift assembly and cable for damage. Is the linear shift assembly or cable damaged?	Go to Step 9	Go to Step 7

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7	Inspect for a faulty lock cylinder. Is the lock cylinder damaged?	Go to Step 10	Go to Step 8
8	Inspect the ignition lock cylinder case. Is the case worn, damaged or loose?	Go to Step 11	Go to Step 12
9	Replace the linear shift assembly. Refer to <u>Linear Shift Assembly Replacement</u> . Did you complete the repair?	Go to Step 12	-
10	Replace the ignition lock cylinder. Refer to <u>Ignition Lock Cylinder Replacement</u> . Did you complete the repair?	Go to Step 12	-
11	Replace the ignition lock cylinder case housing. Refer to <u>Ignition Lock Cylinder Case Replacement</u> . Did you complete the repair?	Go to Step 12	-
12	Operate the system to verify the repair. Did you correct the condition?	System OK	Go to Step 2

IGNITION KEY CANNOT BE REMOVED FROM THE IGNITION LOCK CYLINDER (FLOOR SHIFT)

Ignition Key Cannot Be Removed from the Ignition Lock Cylinder (Floor Shift)

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and Operation and perform the necessary inspections?	Go to Step 2	<u>Steering Wheel and Column Description and Operation</u>
2	Verify the key cannot be removed from the ignition lock cylinder. Is the key stuck in the lock cylinder?	Go to Step 3	System OK
3	Is the vehicle equipped with a manual transmission?	Go to Step 8	Go to Step 4
4	Turn the ignition key to the OFF position. Can the key be turned to the OFF position and be removed?	Go to Step 8	Go to Step 5
5	Verify the adjustment of the automatic transmission shift cable. Refer to <u>Range Selector Lever Cable Adjustment</u> and <u>Range Selector</u>		

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	Lever Cable Adjustment . Can the key be turned to the OFF position and be removed?	System OK	Go to Step 6
6	Inspect the lock cylinder solenoid plunger and spring. Does the plunger or spring exhibit scratches or signs of wear?	Go to Step 10	Go to Step 7
7	Verify the electrical operation of the ignition lock cylinder solenoid. Refer to Ignition Can/Cannot Be Turned Off with Transmission in Any Gear. Can the key be turned to the OFF position and be removed?	System OK	Go to Step 8
8	Inspect for a faulty lock cylinder. Is the lock cylinder damaged?	Go to Step 11	Go to Step 9
9	Inspect the ignition lock cylinder case. Is the case worn, damaged or loose?	Go to Step 12	Go to Step 13
10	Replace the ignition lock cylinder solenoid and spring. Refer to Ignition Lock Cylinder Solenoid Replacement. Did you complete the repair?	Go to Step 13	-
11	Replace the ignition lock cylinder. Refer to Ignition Lock Cylinder Replacement. Did you complete the repair?	Go to Step 13	-
12	Replace the ignition lock cylinder case housing. Refer to Ignition Lock Cylinder Case Replacement. Did you complete the repair?	Go to Step 13	-
13	Operate the system to verify the repair. Did you correct the condition?	System OK	Go to Step 2

IGNITION KEY CANNOT TURN OR STICKS IN ANY POSITION

Ignition Key Cannot Turn or Sticks in Any Position

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column System Description?		Go to Steering Wheel and Column Description

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		Go to Step 2 and Operation	
2	Verify that the lock system has a high lock effort. Does the lock system operate normally?	System OK	Go to Step 3
3	Inspect for an incorrect, worn or damaged key. Is the key incorrect, worn or damaged?	Go to Step 7	Go to Step 4
4	Inspect for a faulty lock cylinder. Is the lock cylinder damaged?	Go to Step 8	Go to Step 5
5	Inspect the ignition lock cylinder case assembly for damage. Is the ignition lock cylinder case assembly damaged?	Go to Step 9	Go to Step 6
6	Inspect the ignition switch assembly for damage. Is the ignition switch assembly damaged?	Go to Step 10	Go to Step 7
7	Replace the key. Refer to Key and Lock Cylinder Coding in General Information. Did you complete the repair?	Go to Step 11	-
8	Replace the lock cylinder. Refer to Ignition Lock Cylinder Replacement . Did you complete the repair?	Go to Step 11	-
9	Replace the ignition lock cylinder case assembly. Refer to Ignition Lock Cylinder Case Replacement . Did you complete the repair?	Go to Step 11	-
10	Replace the ignition switch. Refer to Ignition and Start Switch Replacement . Did you complete the repair?	Go to Step 11	-
11	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

NOISE IN STEERING COLUMN

Noise in Steering Column

Step	Action	Yes	No
	Did you review the Steering Wheel and Column Description and perform the		Go to <u>Steering Wheel and</u>

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			<u>Column Description and Operation</u>
1	necessary inspections?	Go to Step 2	
2	Verify that noise is present in the steering column during operation. Is noise present in the steering column during operation?	Go to Step 3	System OK
3	Inspect the steering column components for looseness. Is the steering column components loose?	Go to Step 8	Go to Step 4
4	Inspect the SIR coil for noise. Is the SIR coil noisy?	Go to Step 9	Go to Step 5
5	Inspect the horn contact ring for lubrication. Is the horn contact ring lubricated?	Go to Step 6	Go to Step 10
6	Inspect the lock plate retaining ring for the correct installation. Is the lock plate retaining ring installed properly?	Go to Step 7	Go to Step 11
7	Inspect the steering column coupling for looseness. Is the steering column coupling loose?	Go to Step 12	Go to Step 3
8	NOTE: Refer to <u>Fastener Notice</u> . Tighten the steering column components to specifications. Refer to <u>Fastener Tightening Specifications</u> . Did you complete the repair?	Go to Step 13	-
9	Replace the SIR coil. Refer to <u>Inflatable Restraint Steering Wheel Module Coil Replacement</u> . Did you complete the repair?	Go to Step 13	-
10	Lubricate the horn contact ring. Did you complete the repair?	Go to Step 13	-
11	Install the lock plate retaining ring properly. Did you complete the repair?	Go to Step 13	-
12	Tighten the steering column coupling to specifications. Refer to <u>Fastener</u>		

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	Tightening Specifications. Did you complete the repair?	Go to Step 13	-
13	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

HIGH SHIFT EFFORT

High Shift Effort

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description?	Go to Step 2	Go to <u>Steering Wheel and Column Description and Operation</u>
2	Verify that a high shift effort is required in order to shift out of the PARK position. Does the shifter operate normally?	System OK	Go to Step 3
3	Inspect for worn or damaged shift linkage components. Are the shift linkage components worn or damaged?	Go to Step 6	Go to Step 4
4	Inspect for a damaged linear shift assembly. Is the linear shift assembly damaged?	Go to Step 7	Go to Step 5
5	Inspect the shift cable for binding or misadjustment. Is the shift cable binding or misadjusted?	Go to Step 8	Go to Step 3
6	Replace the shift cable. Refer to <u>Automatic Transmission Range Selector Lever Cable Replacement (Column Shift) or Automatic Transmission Range Selector Lever Cable Replacement (Console Shift)</u> . Did you complete the repair?	Go to Step 9	-
7	Replace the linear shift assembly. Refer to <u>Linear Shift Assembly Replacement</u> . Did you complete the repair?	Go to Step 9	-
	Adjust the shift cable. Refer to <u>Range</u>		

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8	Selector Lever Cable Adjustment . Did you complete the repair?	Go to Step 9	-
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

LOOSENESS IN STEERING COLUMN

Looseness in Steering Column

Step	Action	Yes	No
1	Did you review the Steering Wheel and Column Description and Operation and perform the necessary inspections?	Go to Step 2	<u>Go to Steering Wheel and Column Description and Operation</u>
2	Verify that the steering column is loose. Is the steering column loose?	Go to Step 3	System OK
3	Inspect the steering column mounting brackets for looseness. Are the steering column mounting brackets loose?	Go to Step 6	Go to Step 4
4	Inspect the support screws for looseness. Are the support screws loose?	Go to Step 7	Go to Step 5
5	Inspect the intermediate shaft for worn joints or looseness. Is the intermediate joint worn or loose?	Go to Step 8	Go to Step 6
6	NOTE: Refer to Fastener Notice . Tighten the brackets to specifications. Refer to Fastener Tightening Specifications. Did you complete the repair?	Go to Step 9	-
7	Tighten the support screws to specifications. Refer to Fastener Tightening Specifications. Did you complete the repair?	Go to Step 9	-
8	Tighten or replace the intermediate shaft as needed. Refer to Intermediate Steering Shaft Replacement.		

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	Did you complete the repair?	Go to Step 9	-
9	Operate the system in order to verify the repair. Did you correct the condition?	System OK	Go to Step 3

REPAIR INSTRUCTIONS

INTERMEDIATE STEERING SHAFT SEAL REPLACEMENT

Tools Required

J 42640 Steering Column Anti-Rotation Pin

Removal Procedure

NOTE: The wheels of the vehicle must be straight ahead and the steering column in the LOCK position before disconnecting the steering column or intermediate shaft from the steering gear. Failure to do so will cause the coil assembly in the steering column to become uncentered which will cause damage to the coil assembly.

1. Lock the steering column using the **J 42640**.
2. Remove the dash insulator.
3. Disconnect the intermediate shaft seal from the steering column.
4. Disconnect the intermediate shaft from the steering column. Refer to [Intermediate Steering Shaft Replacement](#).
5. Push the intermediate shaft down in order to collapse the intermediate shaft.

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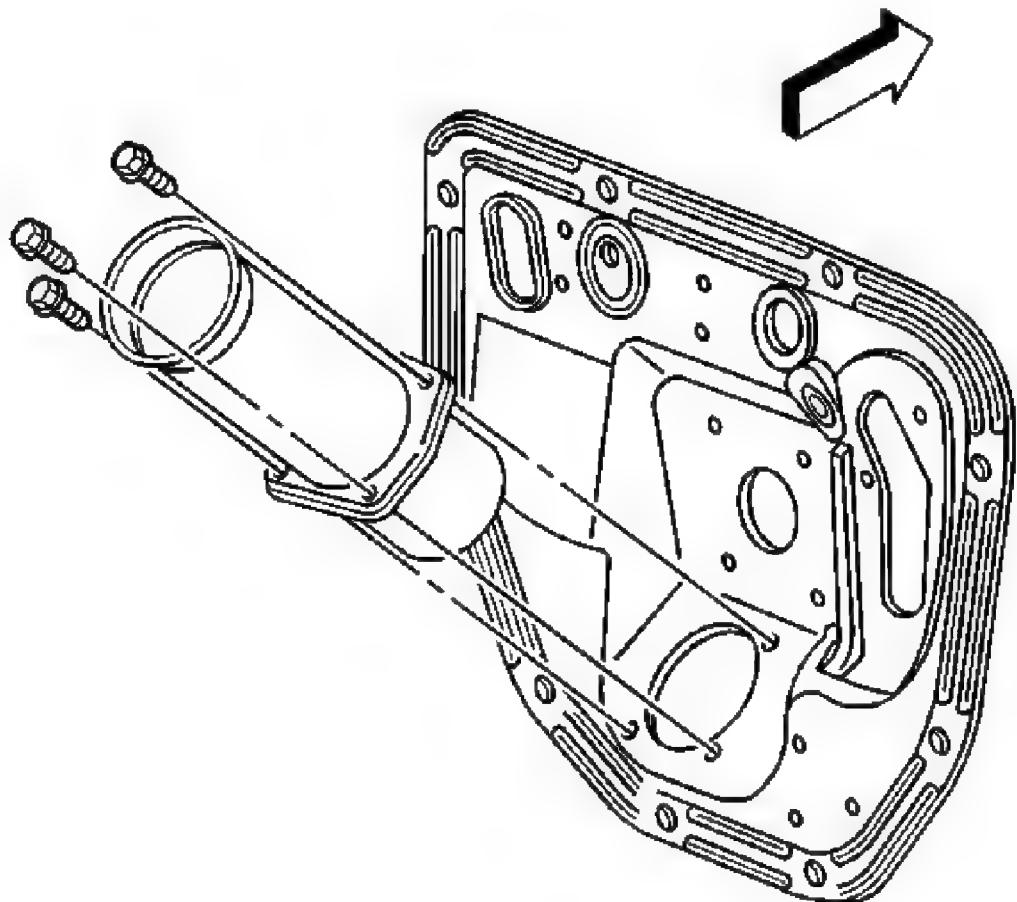


Fig. 6: Locating Intermediate Shaft Seal Bolts

Courtesy of GENERAL MOTORS CORP.

6. Remove the intermediate shaft seal bolts.

IMPORTANT: It may be necessary to remove the lower portion of the intermediate shaft seal from the steering gear.

7. Remove the intermediate shaft seal.

Installation Procedure

1. Install the intermediate shaft lower seal over the intermediate shaft and to the steering gear.
2. Install the intermediate shaft upper seal over the lower seal and to the instrument panel.
3. Connect the intermediate shaft to the steering column. Refer to [Intermediate Steering](#)

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Shaft Replacement.

4. Connect the intermediate shaft seal to the steering column.

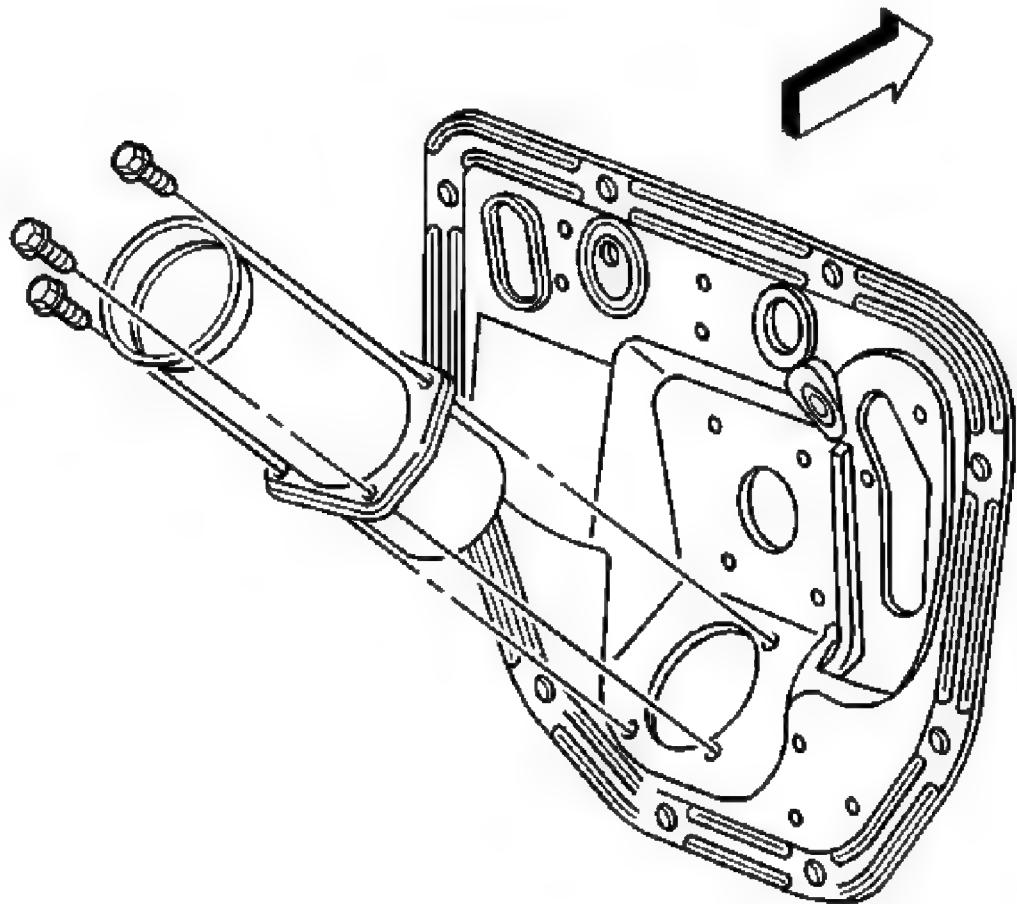


Fig. 7: Locating Intermediate Shaft Seal Bolts

Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice .

5. Install the intermediate shaft seal bolts.

Tighten: Tighten the bolts to 3 N.m (27 lb in).

6. Install the dash insulator.
7. Remove the **J 42640** from the steering column.

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Removal Procedure

1. Remove the steering column. Refer to [Steering Column Replacement](#).
2. Remove the steering column boot seal.

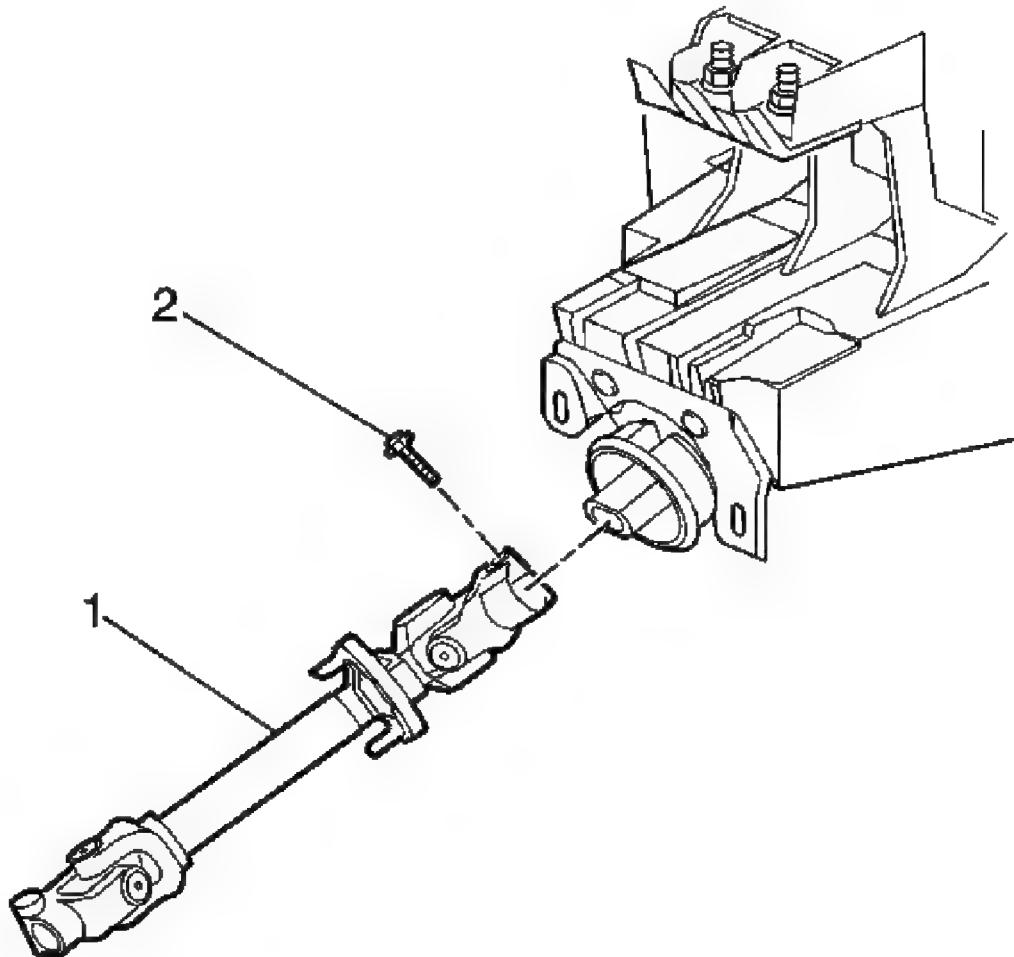


Fig. 8: Removing/Installing Intermediate Steering Shaft
Courtesy of GENERAL MOTORS CORP.

3. Remove the intermediate shaft bolt (2).
4. Remove the intermediate steering shaft (1).

Installation Procedure

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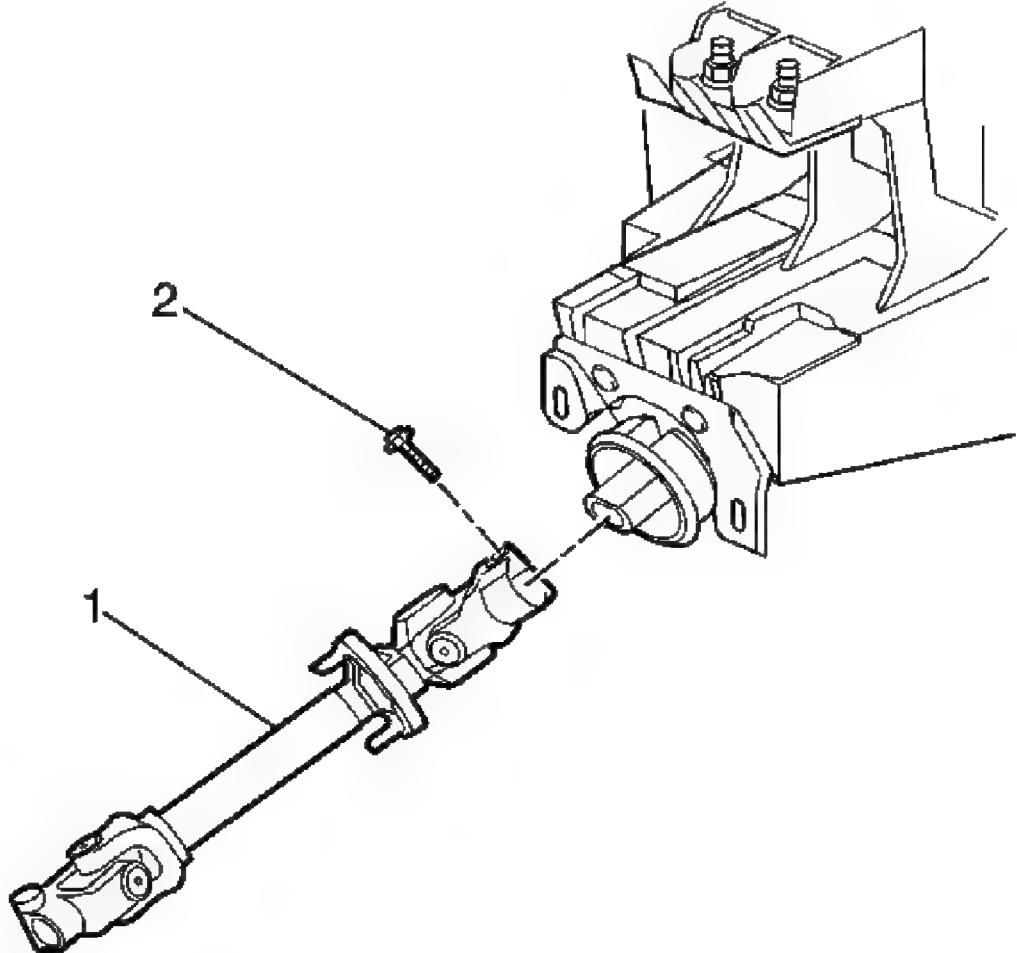


Fig. 9: Removing/Installing Intermediate Steering Shaft
Courtesy of GENERAL MOTORS CORP.

1. Install the intermediate steering shaft (1).

NOTE: Refer to Fastener Notice.

2. Install the intermediate steering shaft bolt (2).

Tighten: Tighten to 47 N.m (35 lb ft).

3. Install the steering column boot seal.
4. Install the steering column. Refer to Steering Column Replacement.

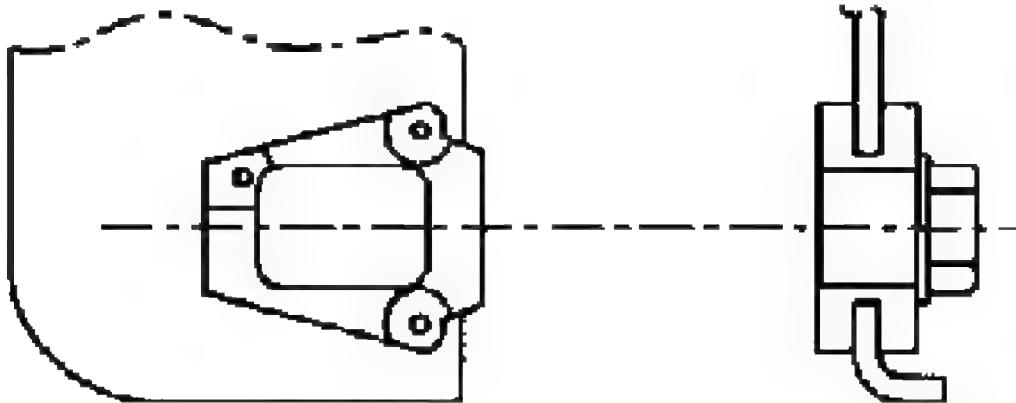


Fig. 10: Inspecting Capsules On Steering Column Bracket Assembly
Courtesy of GENERAL MOTORS CORP.

- Vehicles involved in accidents resulting in frame damage, major body or sheet metal damage or where the steering column has been impacted or where supplemental inflatable restraint systems deployed may also have a damaged or misaligned steering column.
- Inspect the capsules on the steering column bracket assembly. All capsules must be securely seated in the bracket slots and checked for any loose conditions when pushed or pulled by hand.
- Observe how the bracket is attached to the jacket assembly.
 - If the capsules are not securely seated and the bracket is bolted to the jacket assembly, replace only the bracket.
 - If the capsules are not securely seated and the bracket is welded to the jacket assembly, replace only the jacket assembly.

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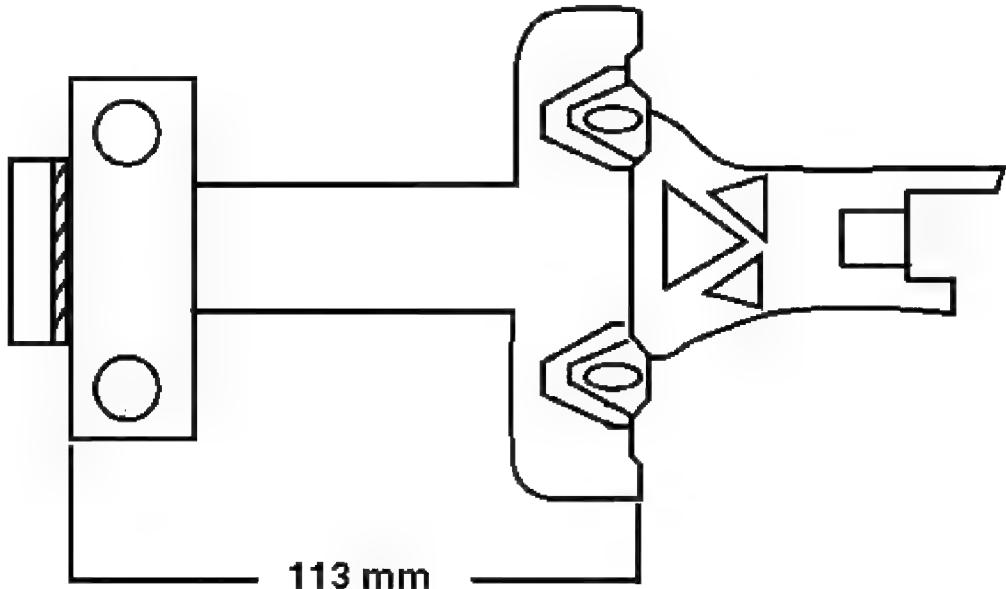


Fig. 11: Inspecting Jacket Assembly Collapse
Courtesy of GENERAL MOTORS CORP.

- Inspect for jacket assembly collapse by measuring the distance shown. Replace the jacket assembly if the measured dimensions are not within specifications.

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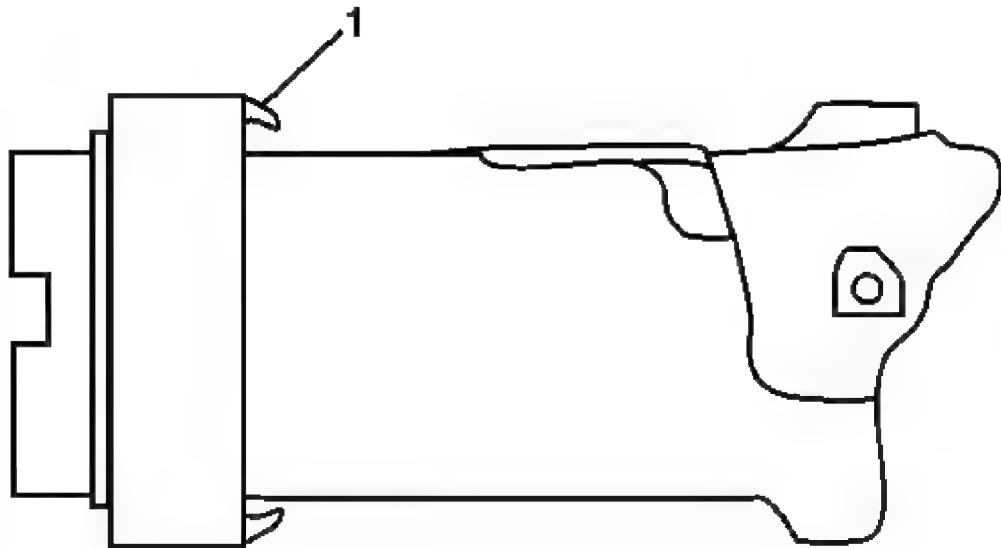


Fig. 12: Inspecting Bearing & Adapter Assembly Tab For Breakage
Courtesy of GENERAL MOTORS CORP.

- Inspect for tab (1) breakage on the bearing and adapter assembly.

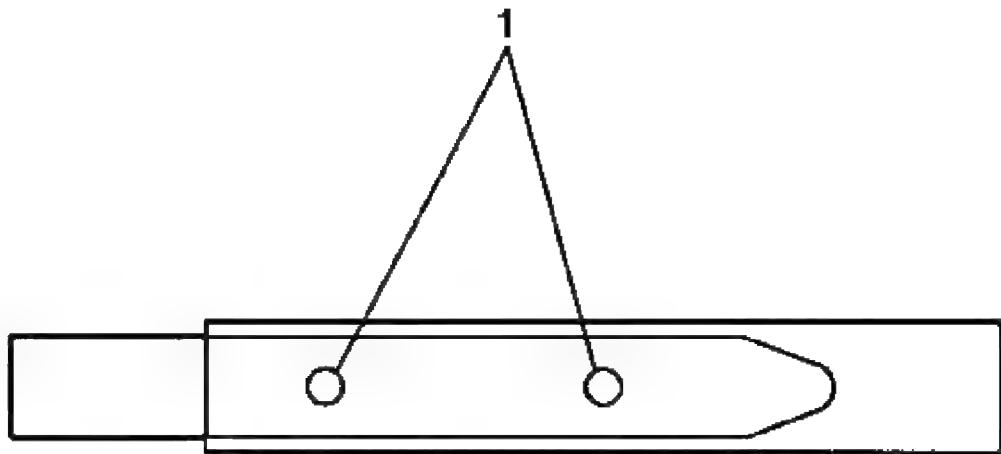


Fig. 13: Inspecting Steering Shaft For Sheared Injected Plastic
Courtesy of GENERAL MOTORS CORP.

- Visually inspect the steering shaft for sheared injected plastic (1). If the steering shaft shows sheared plastic, replace the steering shaft.
- Test the steering shaft runout for any frame damage that could cause a bent steering shaft. Using a dial indicator at the lower end of the steering shaft, rotate the steering wheel. The runout must not exceed 1.60 mm (0.0625 in).

STEERING COLUMN TRIM COVERS REPLACEMENT

Removal Procedure

CAUTION: Refer to SIR Caution .

1. Disable the SIR system. Refer to **SIR Disabling and Enabling** .

CAUTION: Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

CAUTION: Refer to BATTERY DISCONNECT CAUTION .

2. Disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection** .
3. Remove the steering wheel. Refer to **Steering Wheel Replacement** .
4. Remove the knee bolster. Refer to **Driver Knee Bolster Replacement** .
5. Remove the gap hider. Refer to **Instrument Cluster Replacement** .

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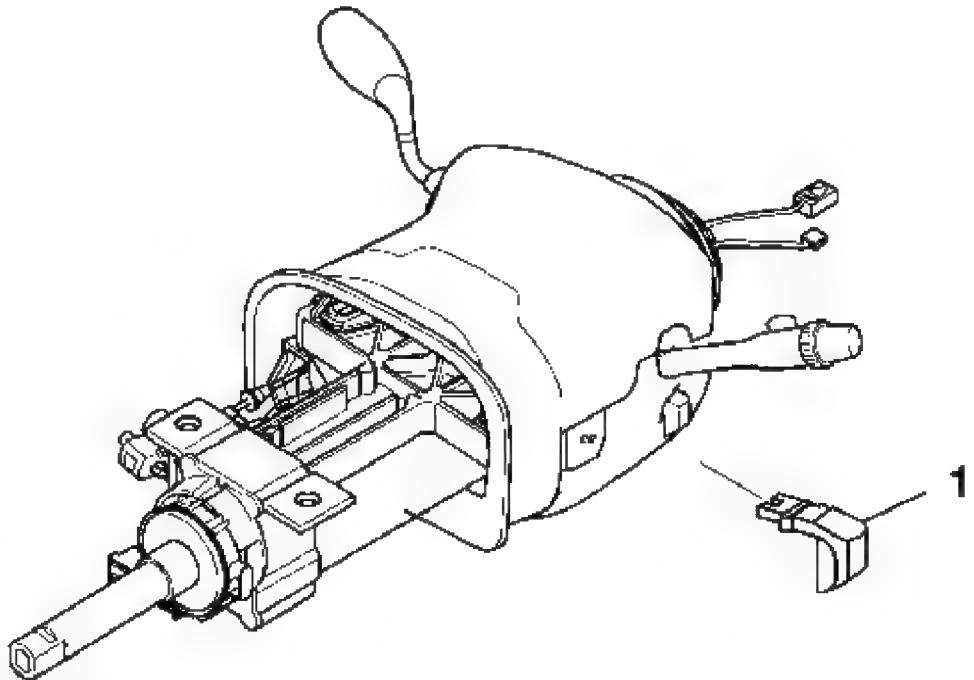


Fig. 14: View Of Tilt Lever

Courtesy of GENERAL MOTORS CORP.

6. Put the steering column in the CENTER position.
7. Remove the tilt lever (1).

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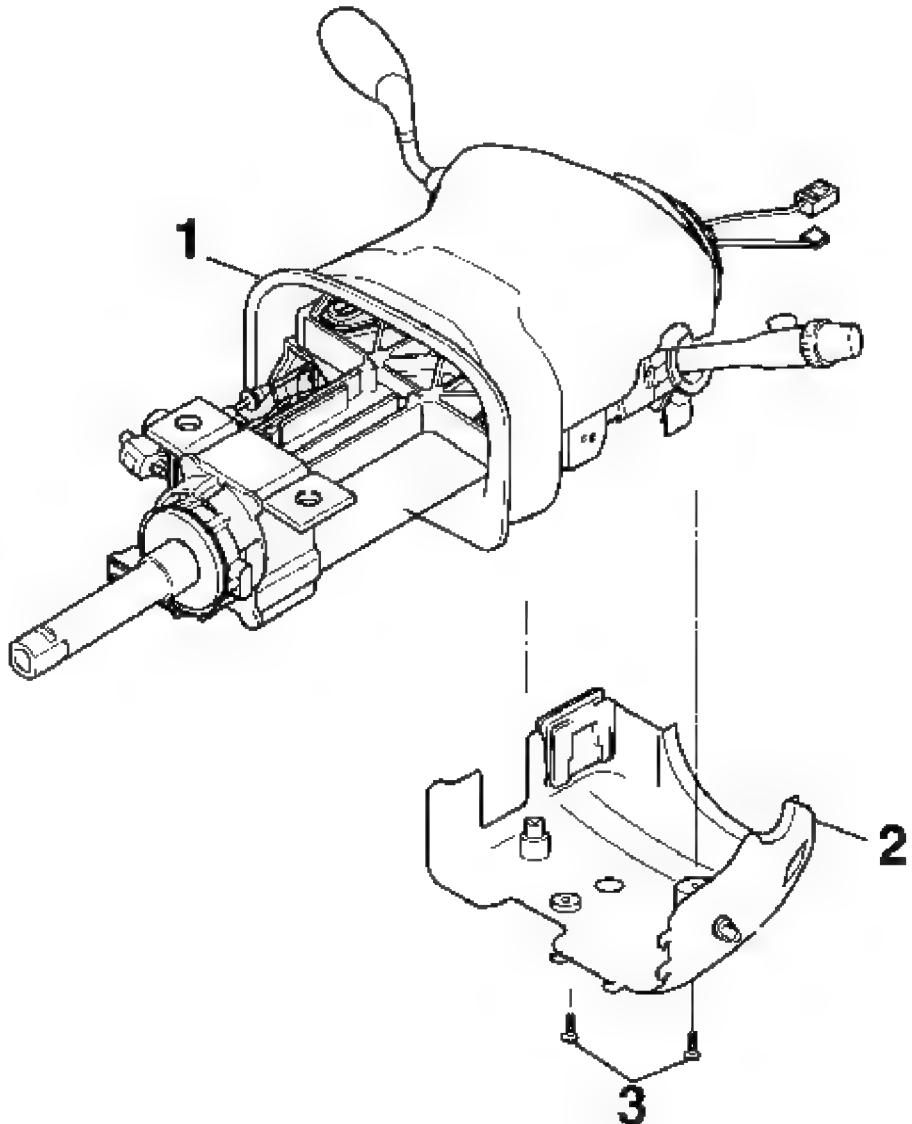


Fig. 15: View Of Lower Steering Column Trim Cover & Screws
Courtesy of GENERAL MOTORS CORP.

8. Remove the retaining screws (3) from the lower steering column trim cover.
9. Disconnect the closeout trim cover from the lower steering column trim cover.

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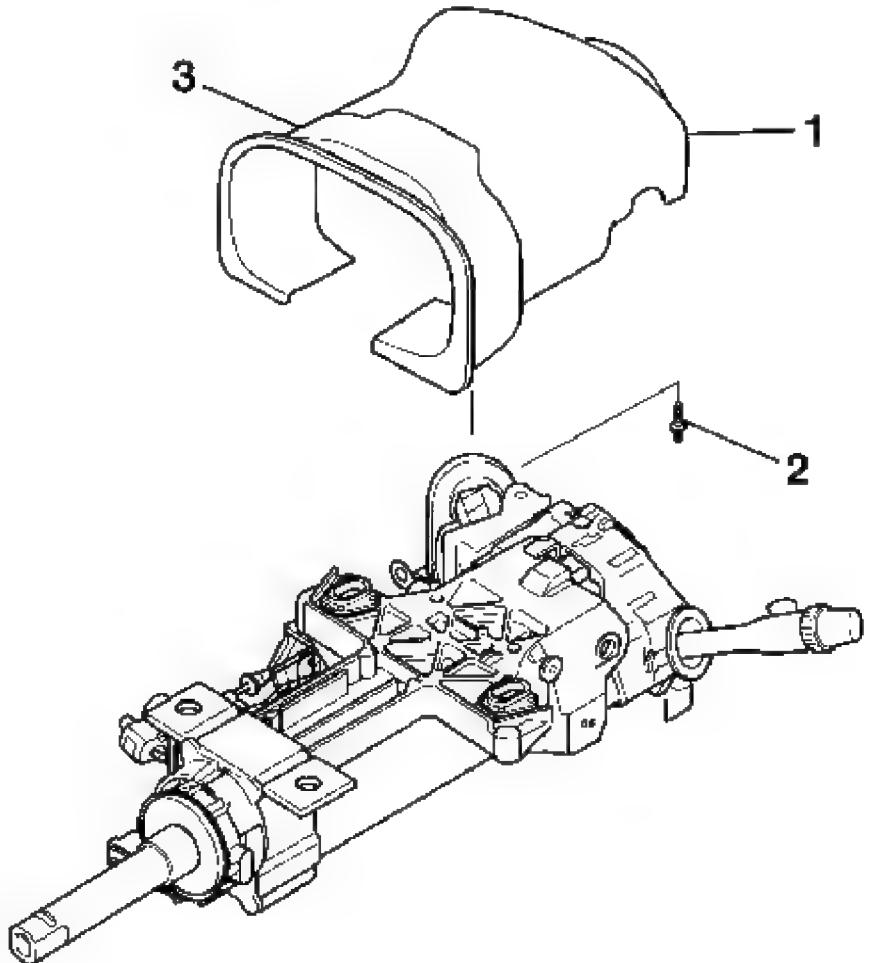


Fig. 16: View Of Upper Steering Column Trim Cover & Screw
Courtesy of GENERAL MOTORS CORP.

10. Remove the retaining screw (2) from the upper steering column trim cover (1).

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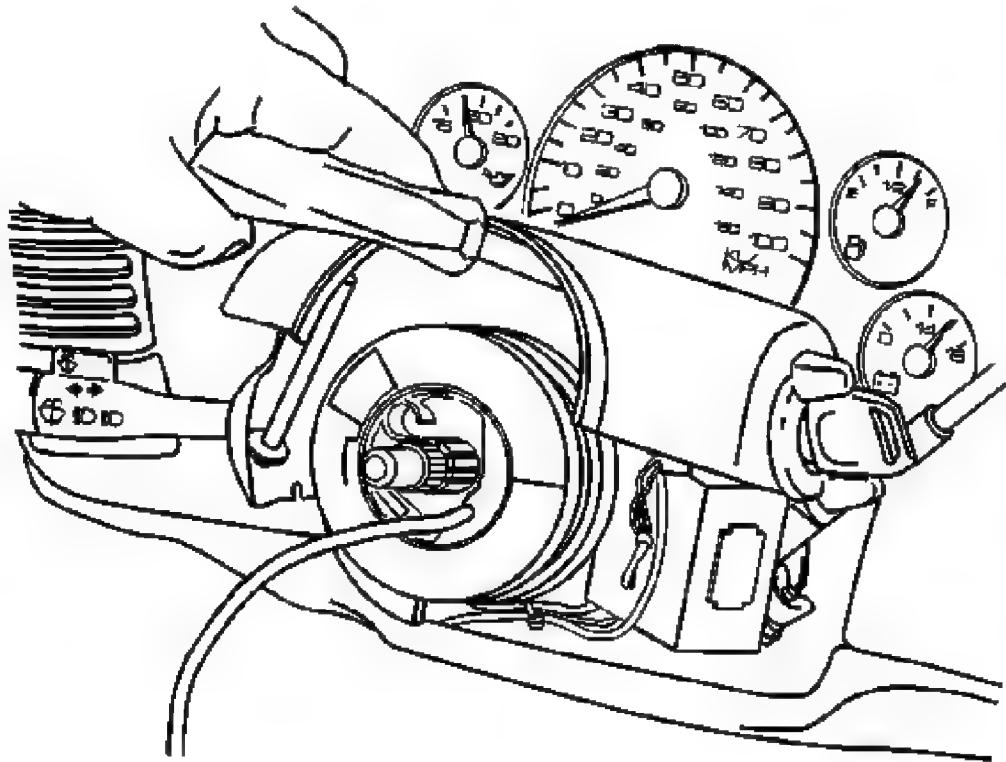


Fig. 17: View of Lock Cylinder Access Hole

Courtesy of GENERAL MOTORS CORP.

11. Lift the upper trim cover to gain access to the lock cylinder access hole.
12. Using a bent tip awl, insert the tip into the access hole in the ignition lock cylinder.

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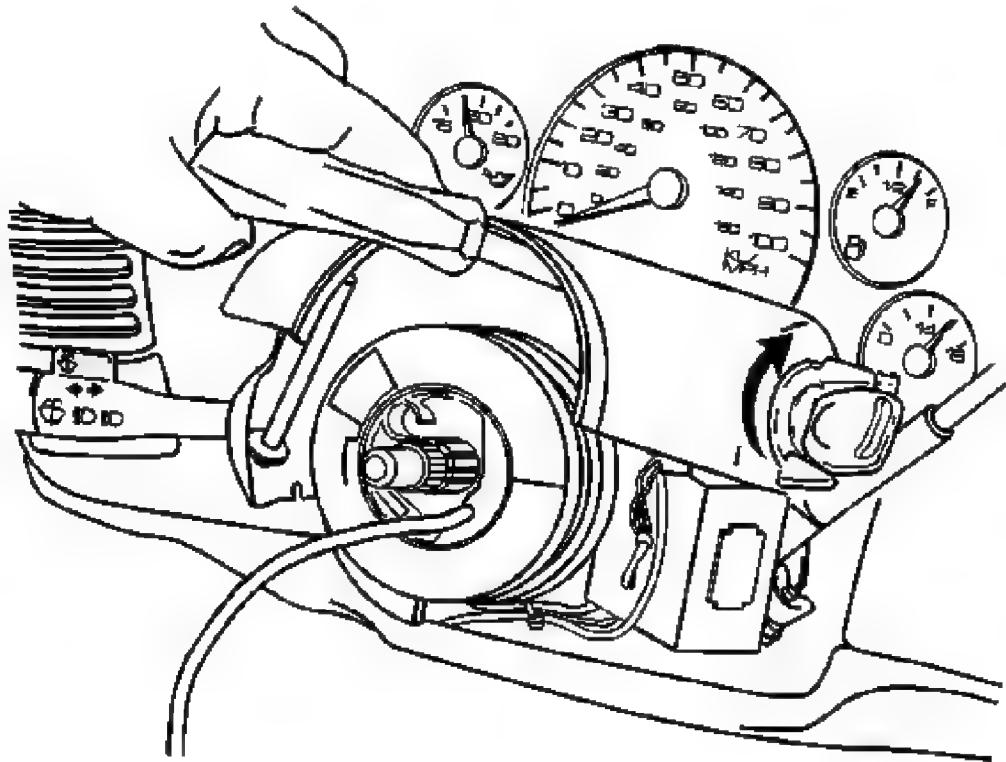


Fig. 18: View of Ignition Lock Cylinder
Courtesy of GENERAL MOTORS CORP.

13. Turn the ignition lock cylinder to the START position.
14. Using the bent tip awl push down on the retaining pin of the ignition lock cylinder.
15. Release the ignition lock cylinder to the RUN position and remove the lock cylinder.
16. Remove the upper trim cover.
17. Remove the closeout trim cover from the upper trim cover.

Installation Procedure

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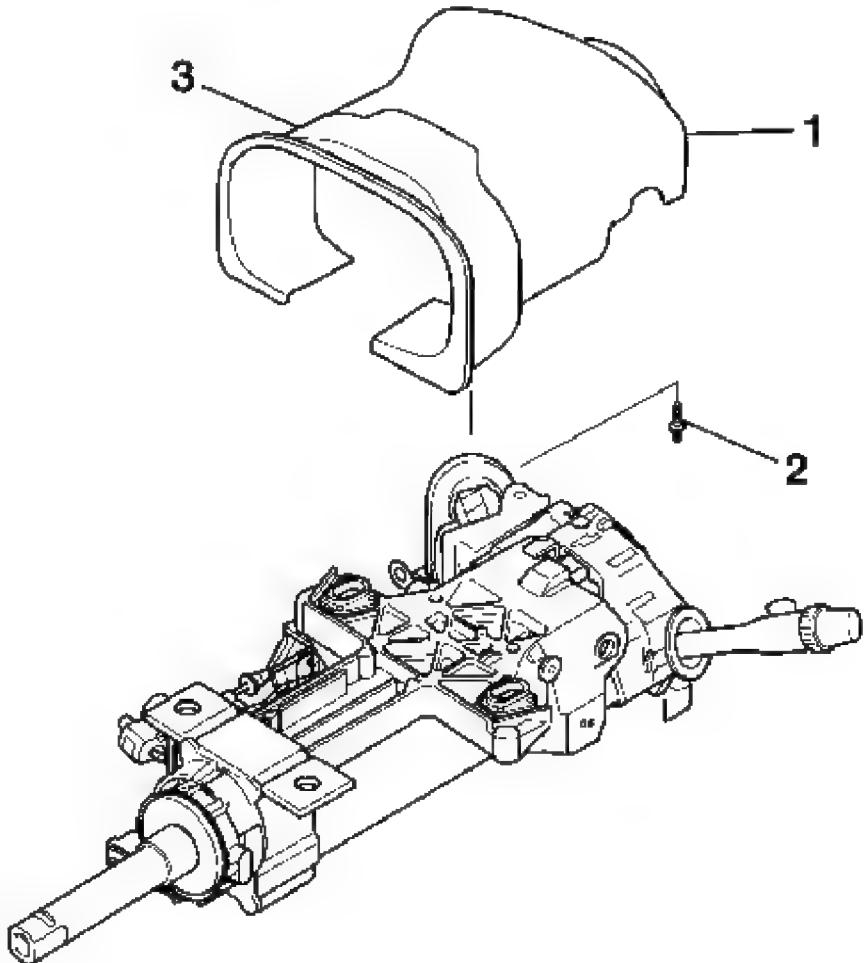


Fig. 19: View Of Upper Steering Column Trim Cover & Screw
Courtesy of GENERAL MOTORS CORP.

1. Install the upper steering column trim cover (1) to the closeout trim cover.
2. Install the upper trim cover (1) to the steering column.

NOTE: Refer to Fastener Notice.

3. Install the retaining screw (2) to the upper steering column trim cover.

Tighten: Tighten the screw to 1.5 N.m (13 lb in).

4. Install the Ignition lock cylinder.

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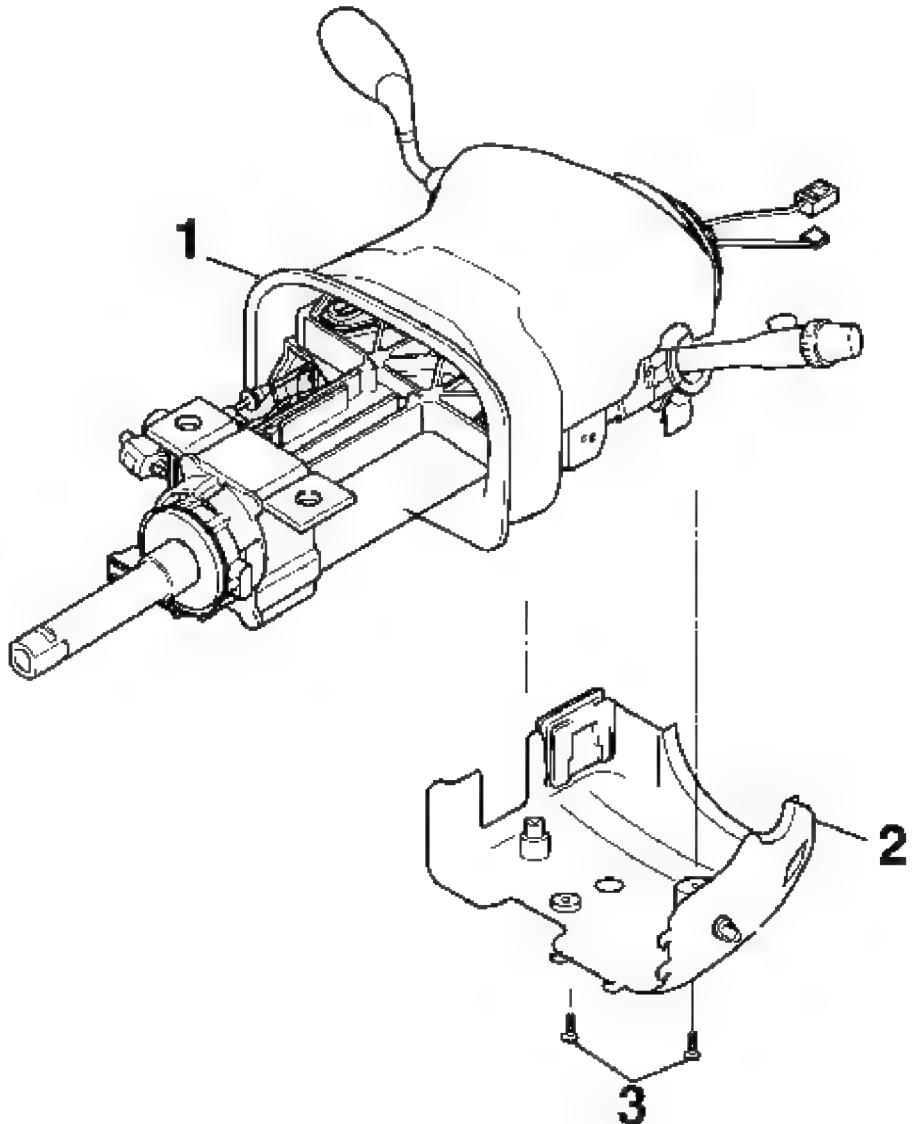


Fig. 20: View Of Lower Steering Column Trim Cover & Screws
Courtesy of GENERAL MOTORS CORP.

5. Install the lower trim cover (2) and ensure that the tabs engage with the tabs on the upper trim cover (1). Snap the tabs together.
6. Connect the lower steering column trim cover to the closeout trim cover.
7. Install the retaining screws (3) to the lower steering column trim cover.

Tighten: Tighten the screws to 3 N.m (27 lb in).

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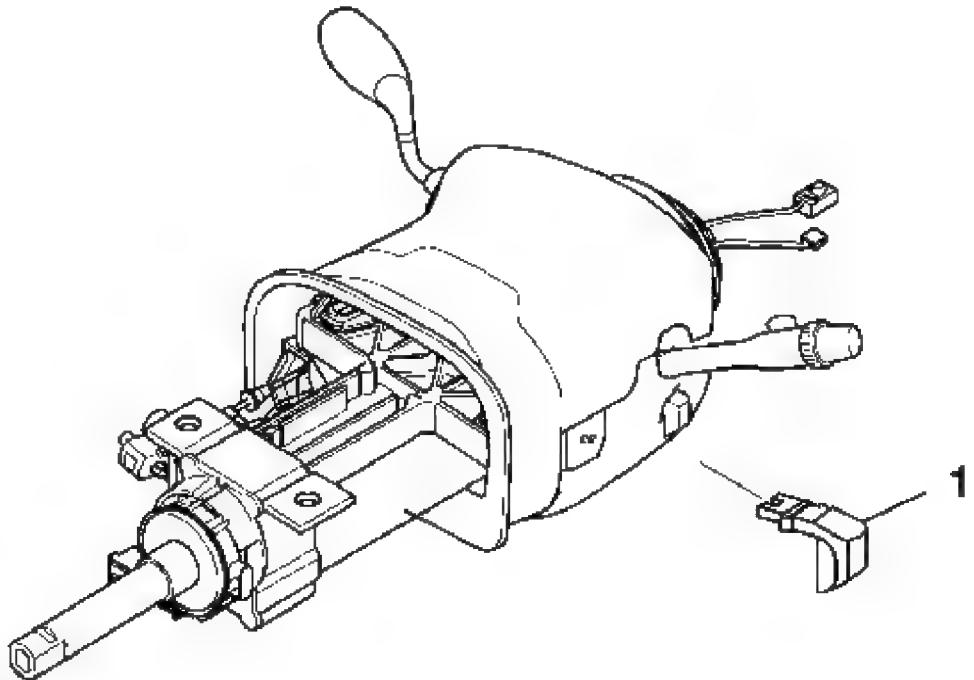


Fig. 21: View Of Tilt Lever

Courtesy of GENERAL MOTORS CORP.

8. Install the tilt lever (1).
9. Install the gap hider. Refer to [Instrument Cluster Replacement](#).
10. Install the knee bolster. Refer to [Driver Knee Bolster Replacement](#).
11. Install the steering wheel. Refer to [Steering Wheel Replacement](#).
12. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
13. Enable the SIR system. Refer to [SIR Disabling and Enabling](#).

IGNITION AND START SWITCH REPLACEMENT

Removal Procedure

CAUTION: Refer to [SIR Caution](#) .

1. Disable the SIR system [SIR Disabling and Enabling](#).

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2. Remove the upper and lower trim covers. Refer to [Steering Column Trim Covers Replacement](#).
3. Remove the ignition lock cylinder. Refer to [Ignition Lock Cylinder Replacement](#).

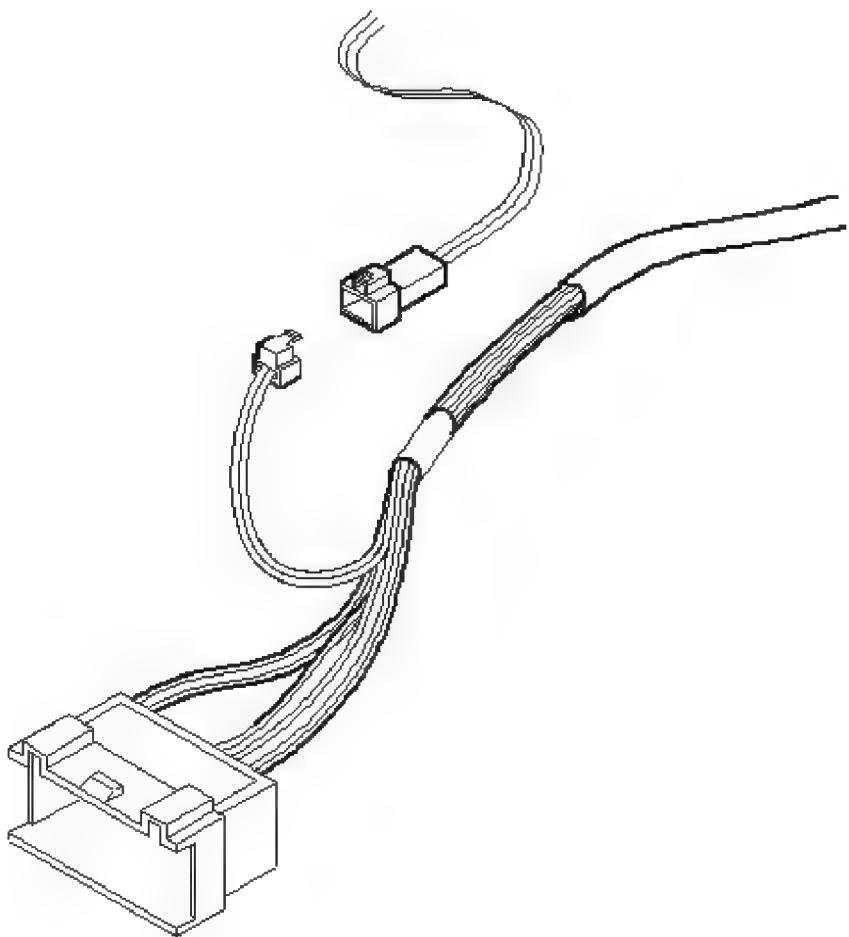


Fig. 22: Disconnecting/Reconnecting Theft Deterrent Control Module Connector
Courtesy of GENERAL MOTORS CORP.

4. Disconnect the theft deterrent control module connector.
5. Disconnect the fused jumper assembly connector.

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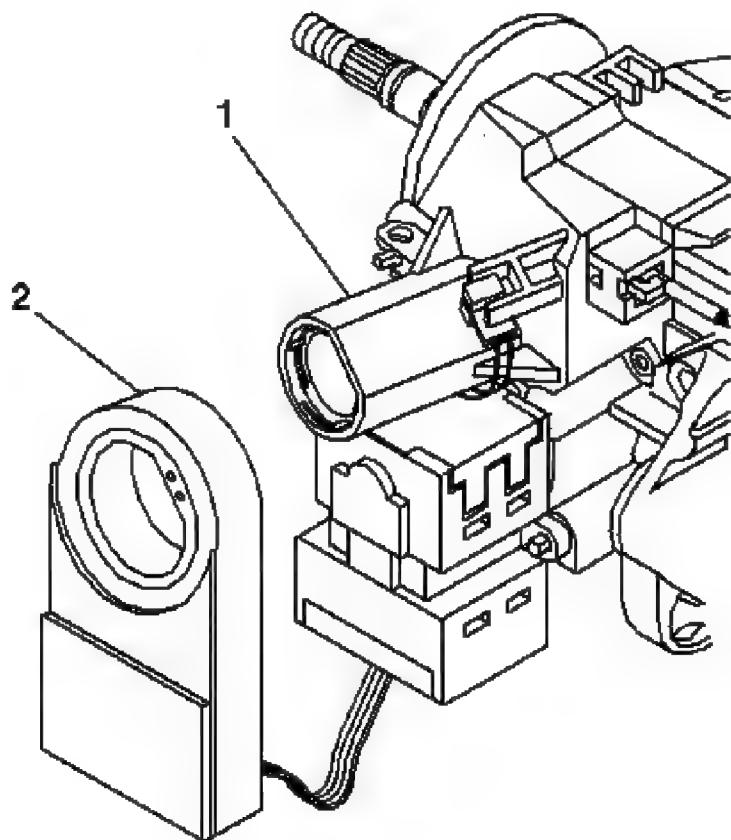


Fig. 23: Locating Theft Deterrent Module & Ignition Lock Cylinder Case Assembly

Courtesy of GENERAL MOTORS CORP.

6. Slide the theft deterrent control module (2) from the ignition lock cylinder case (1).

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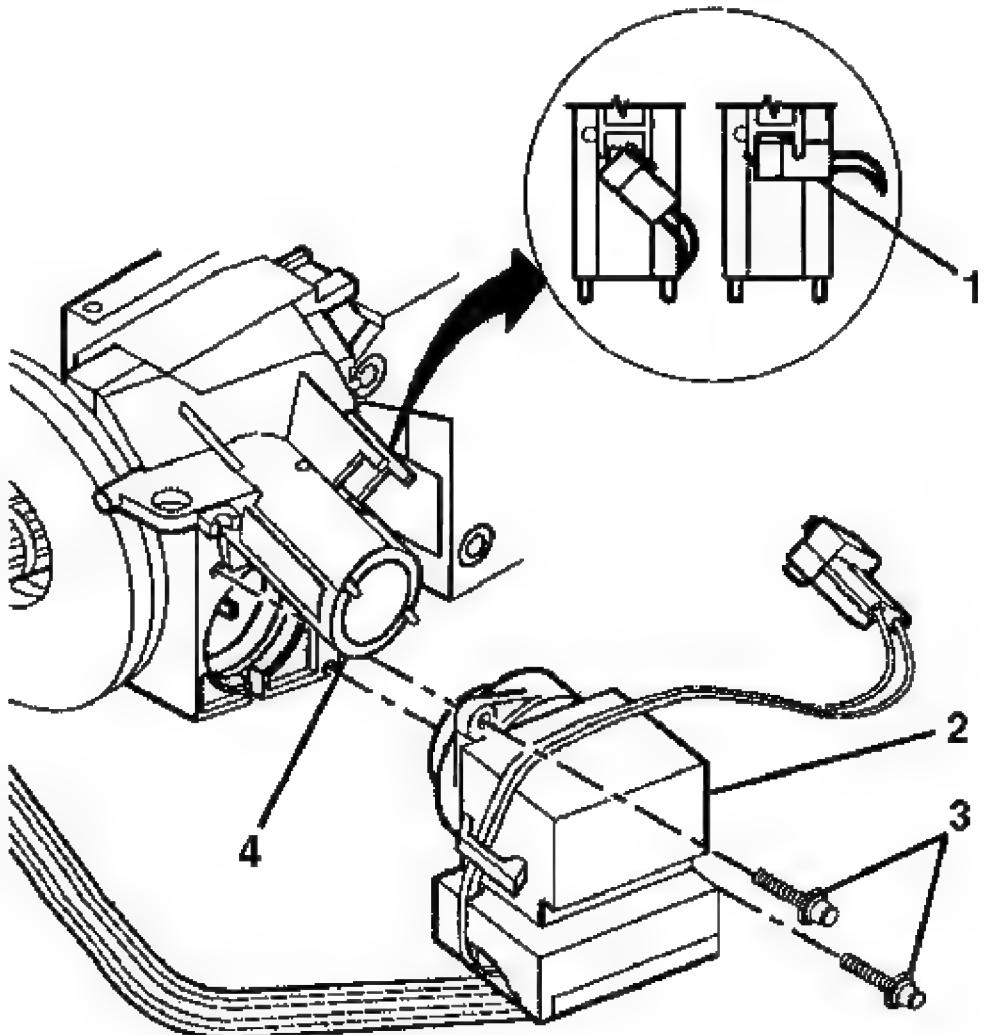


Fig. 24: Removing/Installing Key Alarm Connector To/From Ignition Lock Cylinder Case

Courtesy of GENERAL MOTORS CORP.

7. Remove the key alarm connector (1) from the ignition lock cylinder case (4).
8. Remove the 2 tapping screws (3) from the ignition switch assembly (2).

Installation Procedure

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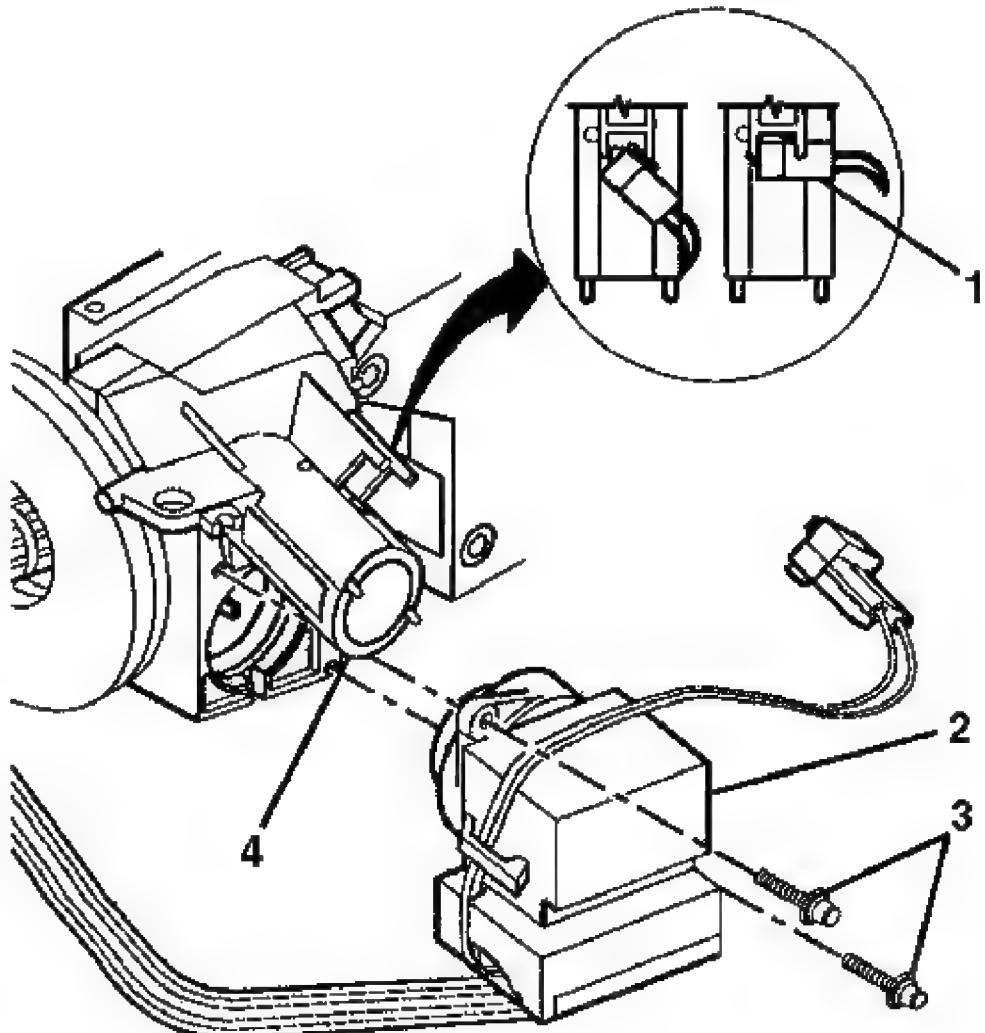


Fig. 25: Removing/Installing Key Alarm Connector To/From Ignition Lock Cylinder Case

Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice.

1. Install the ignition switch assembly (2) and secure by using 2 tapping screws (3).
Tighten: Tighten the screws to 1.5 N.m (13 lb in).
2. Install the ignition switch assembly connector (1) onto the ignition lock cylinder case (4).

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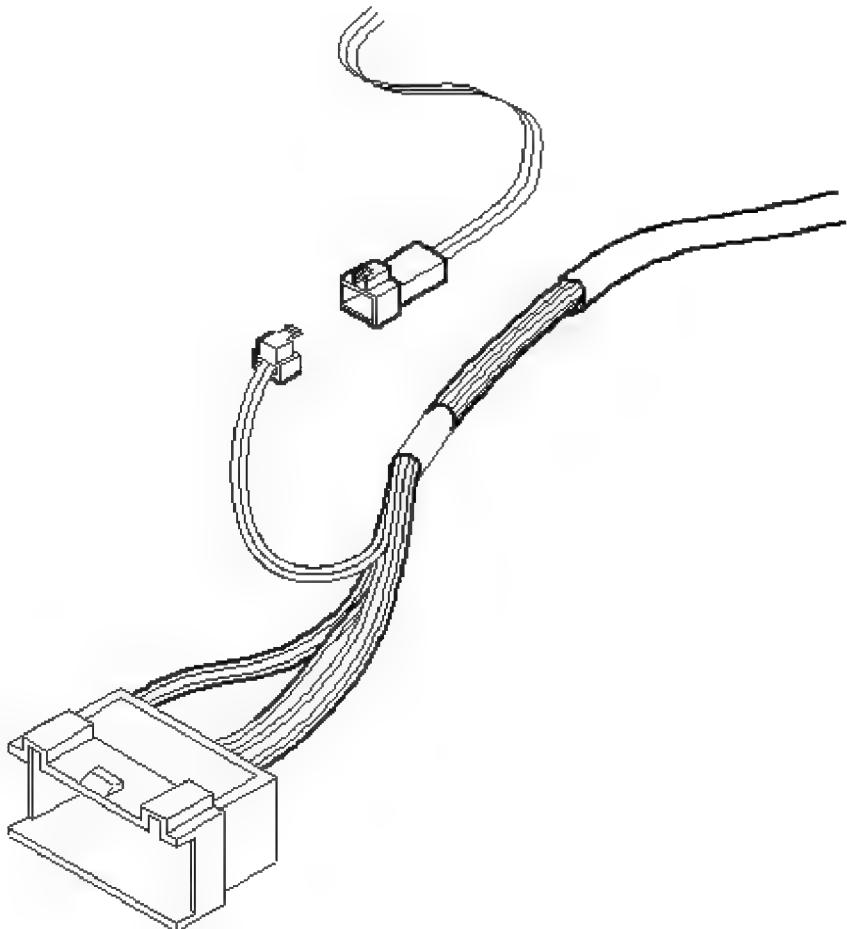


Fig. 26: Disconnecting/Reconnecting Theft Deterrent Control Module Connector
Courtesy of GENERAL MOTORS CORP.

3. Connect the theft deterrent control module connector.
4. Connect the fused jumper assembly connector.

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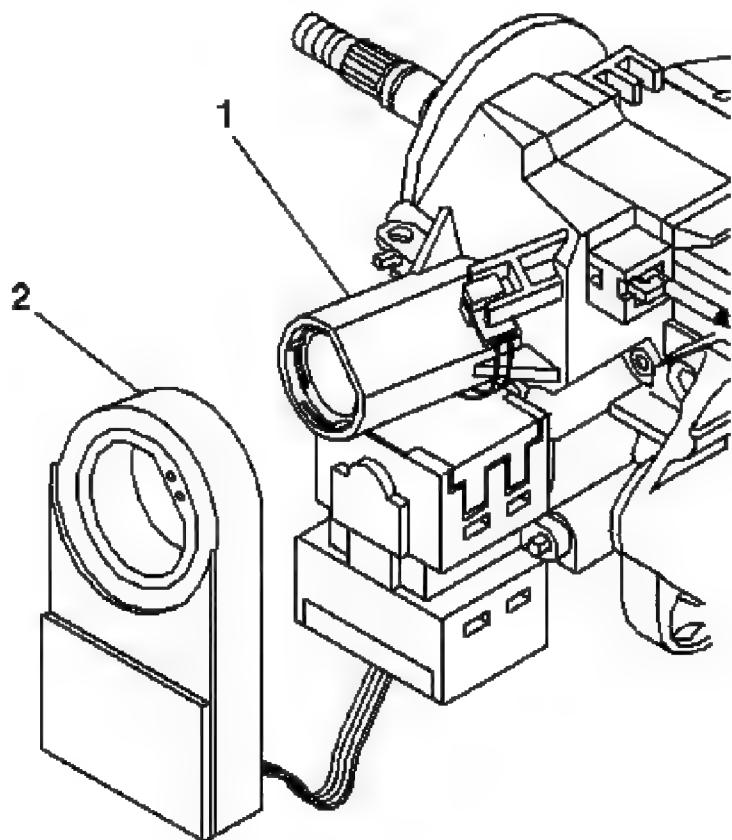


Fig. 27: Locating Theft Deterrent Module & Ignition Lock Cylinder Case Assembly

Courtesy of GENERAL MOTORS CORP.

5. Install the theft deterrent control module (2) onto the ignition lock cylinder case (1).
6. Install the ignition lock cylinder. Refer to [Ignition Lock Cylinder Replacement](#).
7. Install the upper and lower trim covers. Refer to [Steering Column Trim Covers Replacement](#).
8. Enable the SIR system. Refer to [SIR Disabling and Enabling](#).

IGNITION LOCK CYLINDER REPLACEMENT

Removal Procedure

1. Disconnect the battery negative cable. Refer to **Battery Negative Cable Disconnection and Connection**.

CAUTION: Refer to SIR Caution .

2. Disable the SIR system. Refer to **SIR Disabling and Enabling**.
3. Remove the steering wheel. Refer to **Steering Wheel Replacement**.

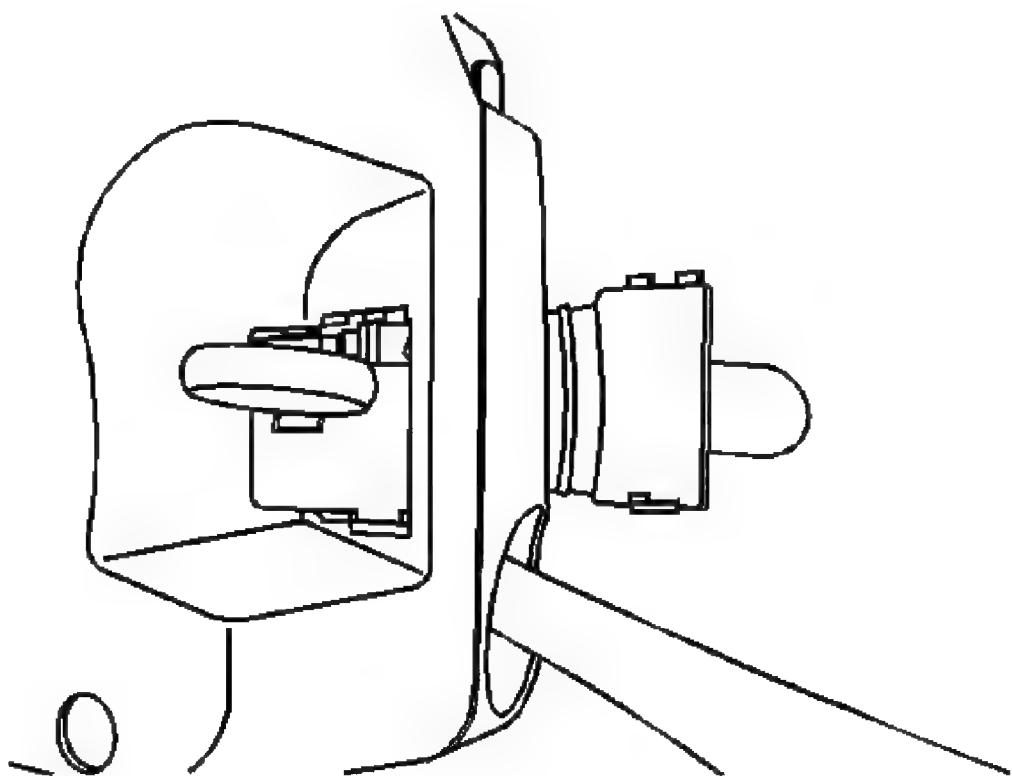


Fig. 28: View Of Tilt Lever Close Out Plate
Courtesy of GENERAL MOTORS CORP.

4. Remove the retaining screw from the lower steering column trim covers.
5. Tilt the trim cover down and slide rearward in order to disengage the locking tabs. Remove the lower steering column trim covers.
6. Remove the retaining screws from the upper steering column trim cover.

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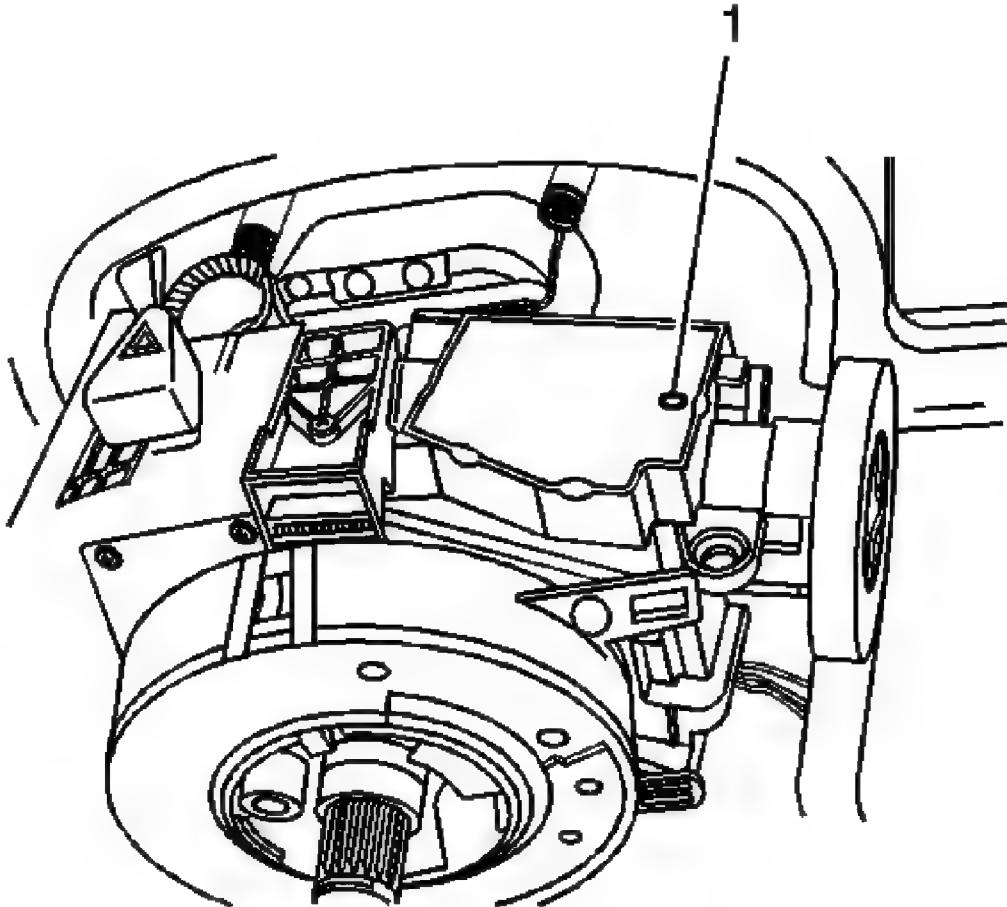


Fig. 29: Locating Lock Cylinder Access Hole

Courtesy of GENERAL MOTORS CORP.

7. Lift the trim cover in order to gain access to the lock cylinder access hole (1).

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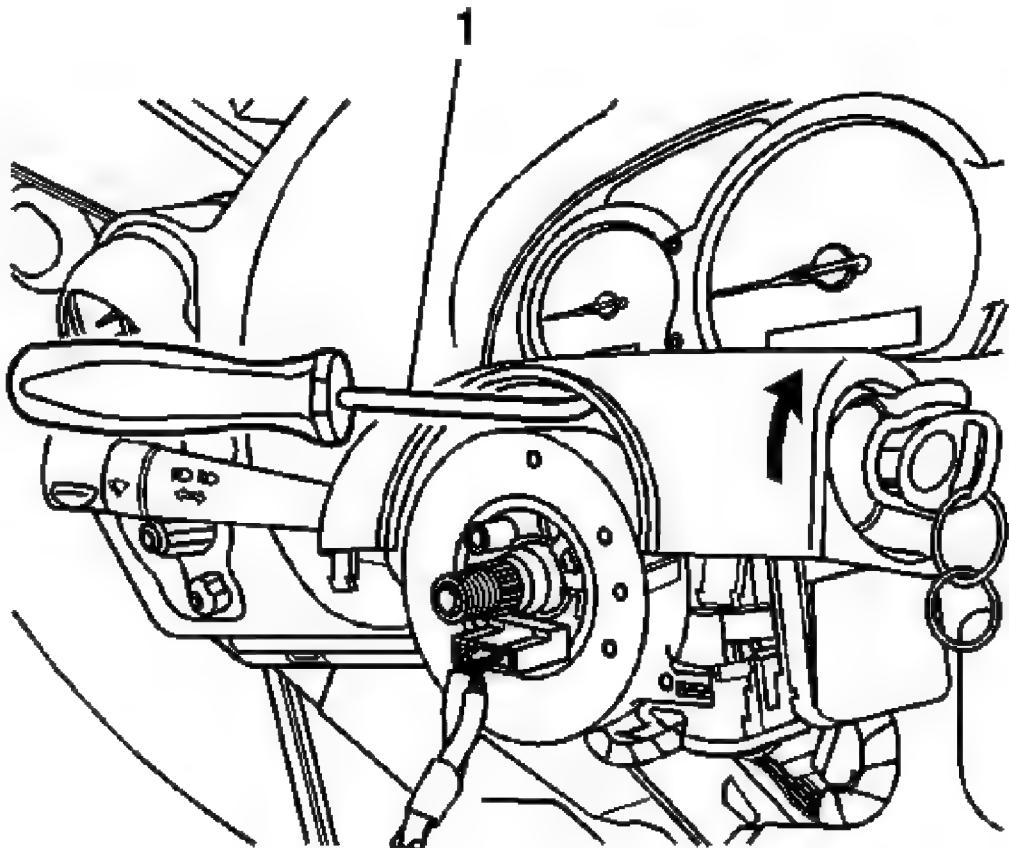


Fig. 30: Inserting A173A Into Access Hole Of Ignition Lock Cylinder
Courtesy of GENERAL MOTORS CORP.

8. Insert the Snap-On A173A bent-tip awl (1) or equivalent, with a 2.5 mm (3/32 in) tip and 20 mm (3/4 in) in length, into the access hole of the ignition lock cylinder.
9. Turn the ignition lock cylinder to START.
10. Use the bent tip in order to push down on the ignition lock cylinder retainer.
11. Release the ignition lock cylinder to the RUN position.

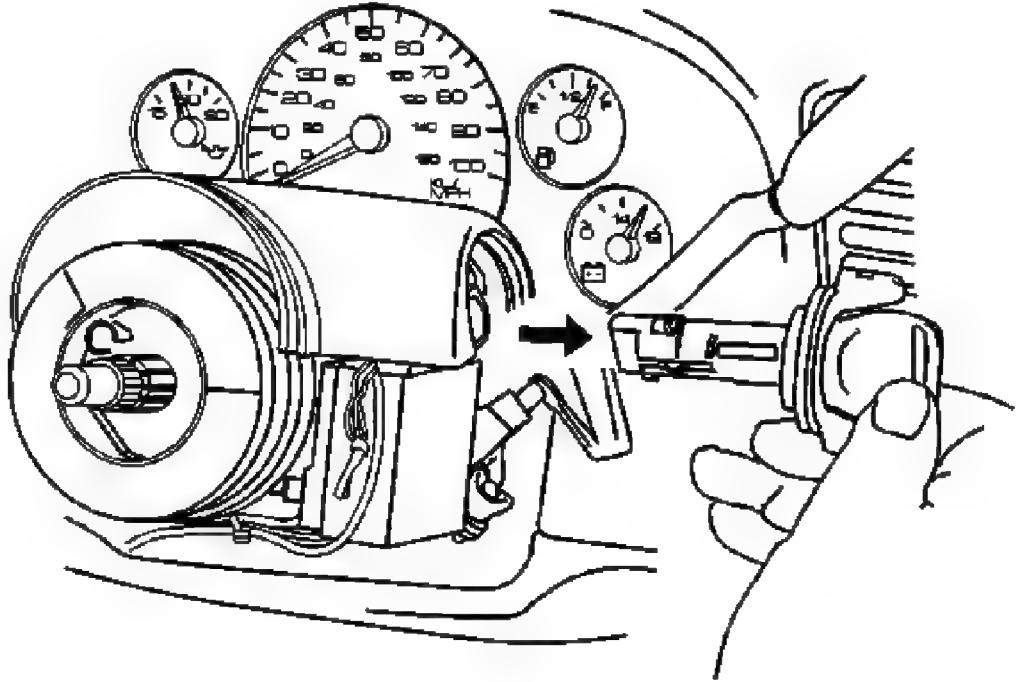


Fig. 31: View of Ignition Lock Cylinder, Ignition Lock Cylinder Case Assembly, and Steering Column

Courtesy of GENERAL MOTORS CORP.

12. Remove the ignition lock cylinder from the lock cylinder case.

Installation Procedure

1. Insert the ignition lock cylinder through the trim cover in the upper steering column.
2. Align the lock cylinder retaining tab and the position tab with the slots in the lock housing.

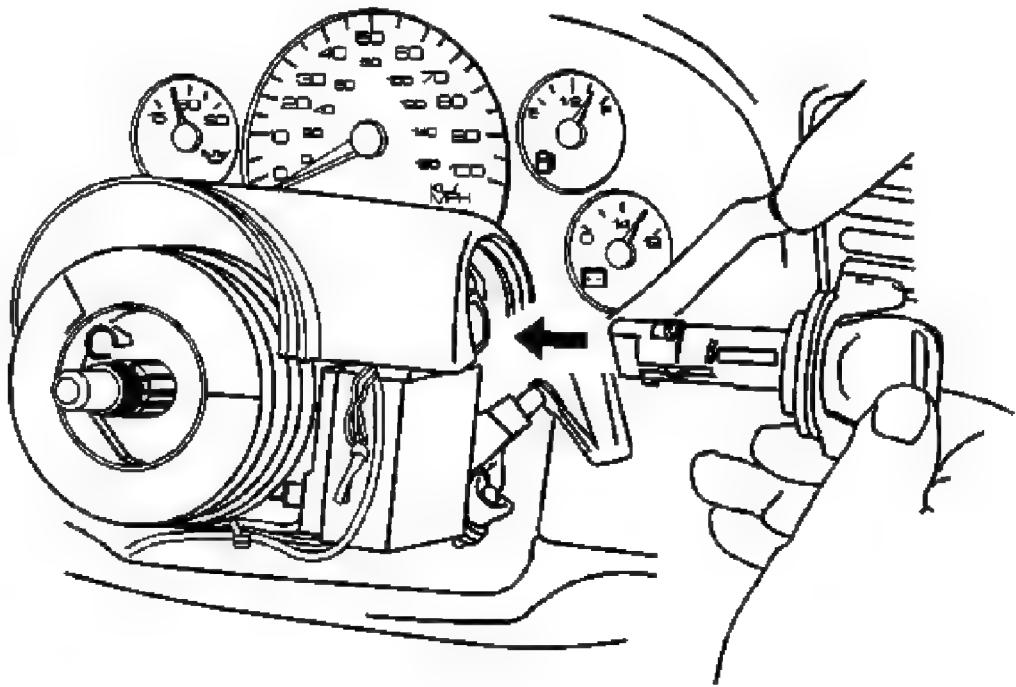


Fig. 32: View of Ignition Cylinder Lock, Ignition Lock Cylinder Case Assembly and Upper Steering Column

Courtesy of GENERAL MOTORS CORP.

3. Completely push the lock cylinder into the lock housing.

NOTE: Refer to FASTENER NOTICE.

4. Install the retaining screws to the upper steering trim cover.

Tighten: Tighten the screws to 3.5 N.m (31 lb in).

5. Match the tab slots on the lower trim cover with the locking tabs on the upper trim cover.
6. Tilt the lower trim cover up and slide the lower trim cover until the locking tabs snap into the tab slots.
7. Install the lower trim cover screws to the steering column.

Tighten: Tighten the screws to 1.5 N.m (13 lb in).

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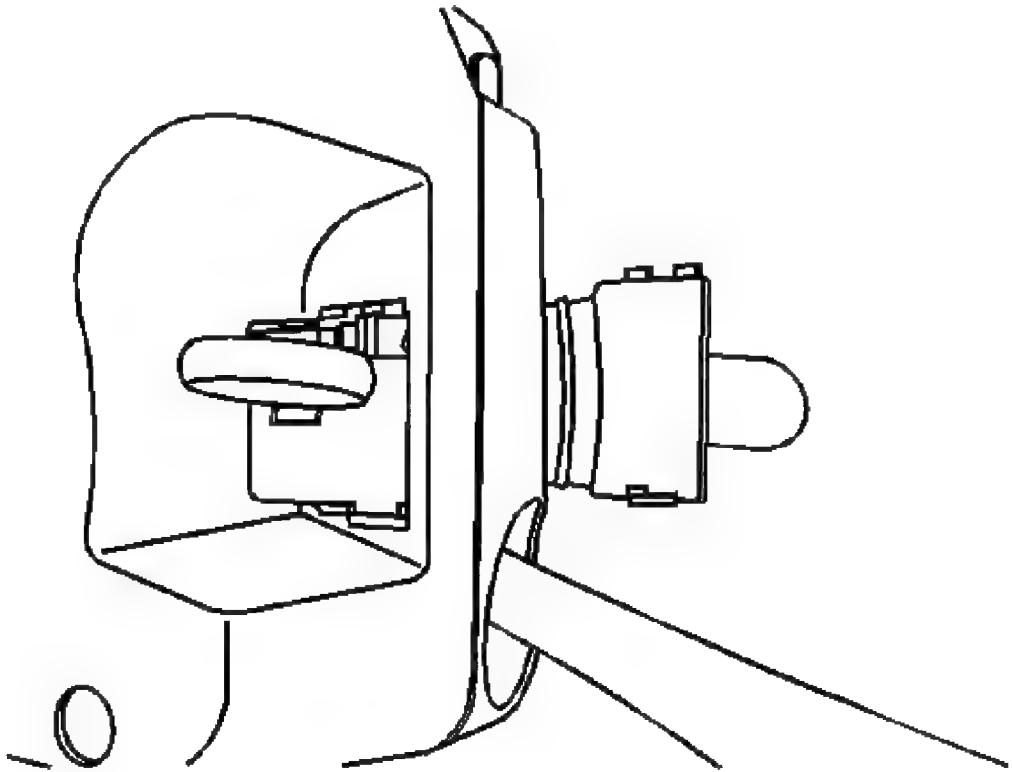


Fig. 33: View Of Tilt Lever Close Out Plate
Courtesy of GENERAL MOTORS CORP.

8. Install the steering wheel. Refer to [Steering Wheel Replacement](#).
9. Enable the SIR system. Refer to [SIR Disabling and Enabling](#).
10. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).

IGNITION LOCK CYLINDER CASE REPLACEMENT

Tools Required

J 41396 Park Lock Cable Pliers. See [Special Tools](#).

Removal Procedure

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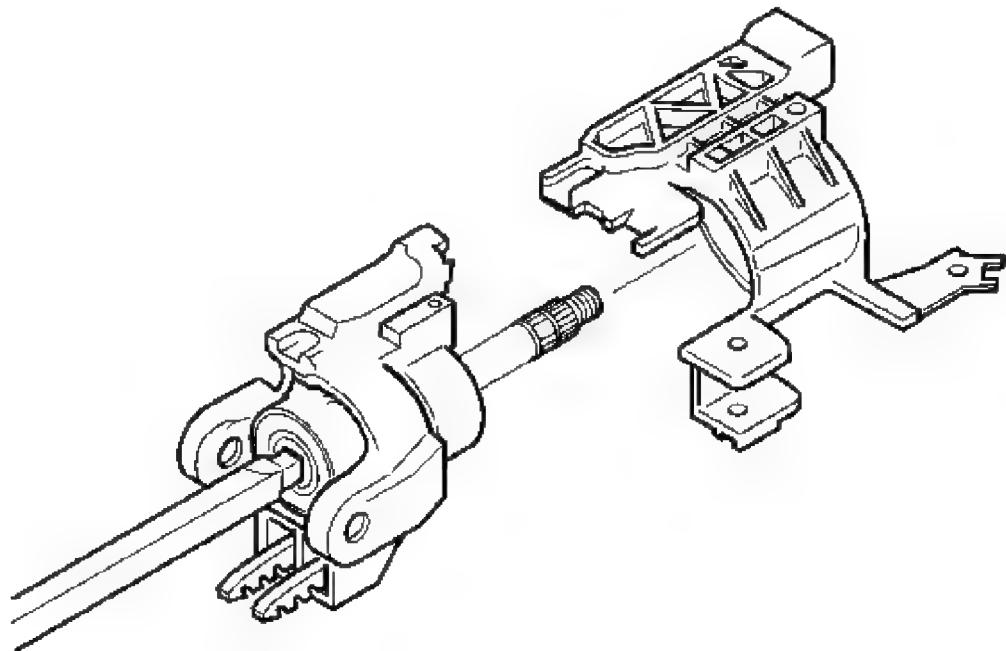


Fig. 34: View Of Turn Signal Switch Housing & Steering Column Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

CAUTION: This vehicle is equipped with a Supplemental Inflatable Restraint (SIR) System. Failure to follow the correct procedure could cause the following conditions:

- Air bag deployment
- Personal injury
- Unnecessary SIR system repairs

In order to avoid the above conditions, observe the following guidelines:

- Refer to SIR Component Views in order to determine if you are performing service on or near the SIR components or the SIR wiring.
- If you are performing service on or near the SIR components or the SIR wiring, disable the SIR

system. Refer to SIR Disabling and Enabling .

1. Disable the SIR system. Refer to SIR Disabling and Enabling in SIR.
2. Remove the ignition lock cylinder. Refer to Ignition Lock Cylinder Replacement.
3. Remove the ignition switch. Refer to Ignition and Start Switch Replacement.
4. Remove the steering column tilt head components. Refer to Steering Column Tilt Head Housing Replacement.
5. Remove the turn signal and multifunction switch assembly only. Refer to Turn Signal Multifunction Switch Replacement.
6. Slide the ignition lock cylinder case bracket off of the steering column shaft assembly.

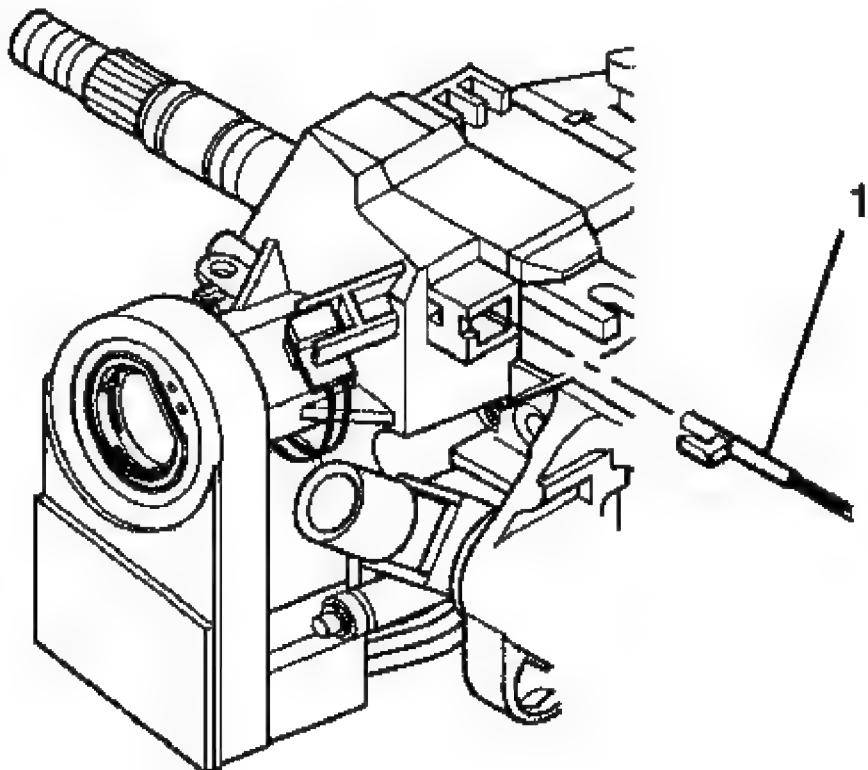


Fig. 35: Identifying Park Lock Cable At Ignition Lock Cylinder
Courtesy of GENERAL MOTORS CORP.

7. Remove the park lock cable assembly (1) from the ignition lock cylinder case in the following way:

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1. Place the steering column lock cylinder set into the OFF position.
2. Place the shift lever clevis into the PARK position.
3. Use a small blade to push against the locking tab on the end of the park lock cable assembly (1).
4. Disconnect the park lock cable assembly (1) from the ignition lock cylinder case.

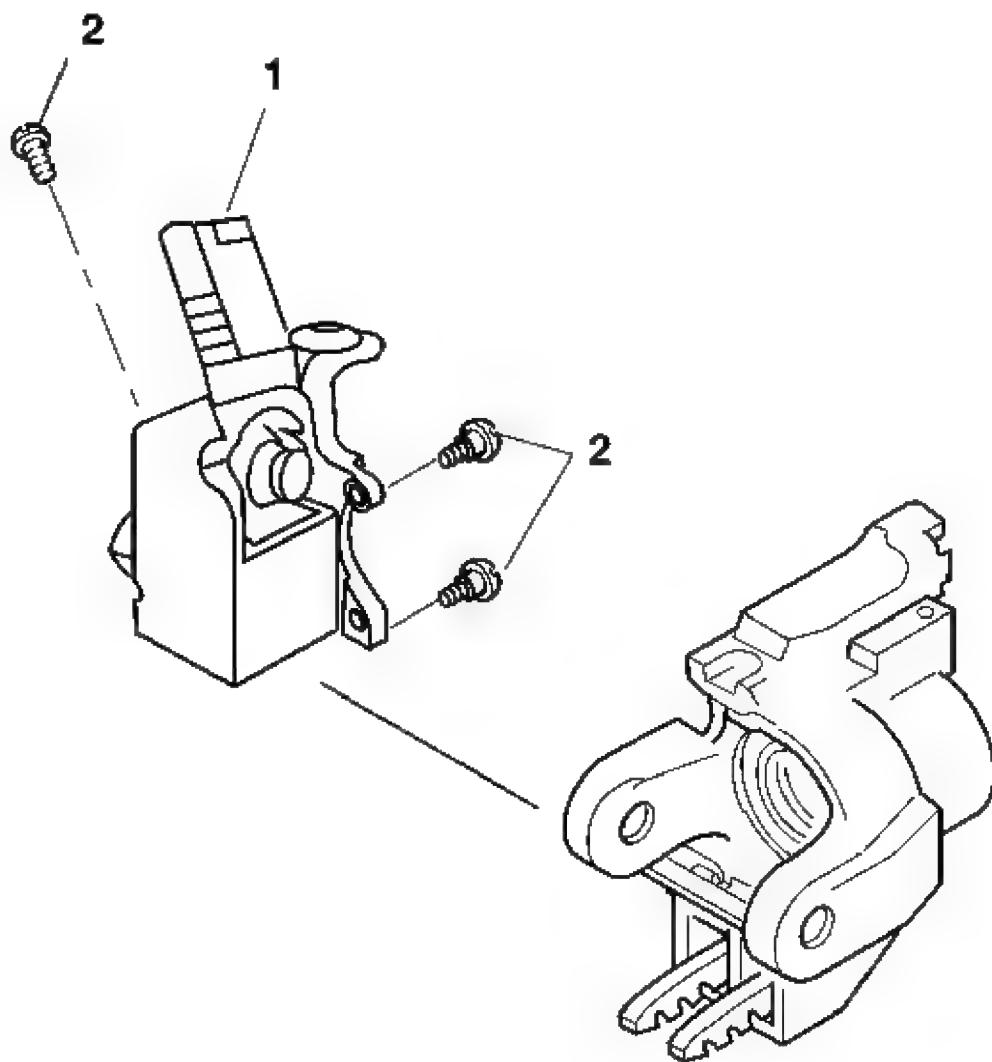


Fig. 36: View Of Ignition Lock Cylinder Case Assembly & Screws
Courtesy of GENERAL MOTORS CORP.

8. Remove the 3 TORX® screws (2) from the ignition lock cylinder case (1).

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9. Remove the ignition lock cylinder case (1) from the steering column tilt head assembly.

Installation Procedure

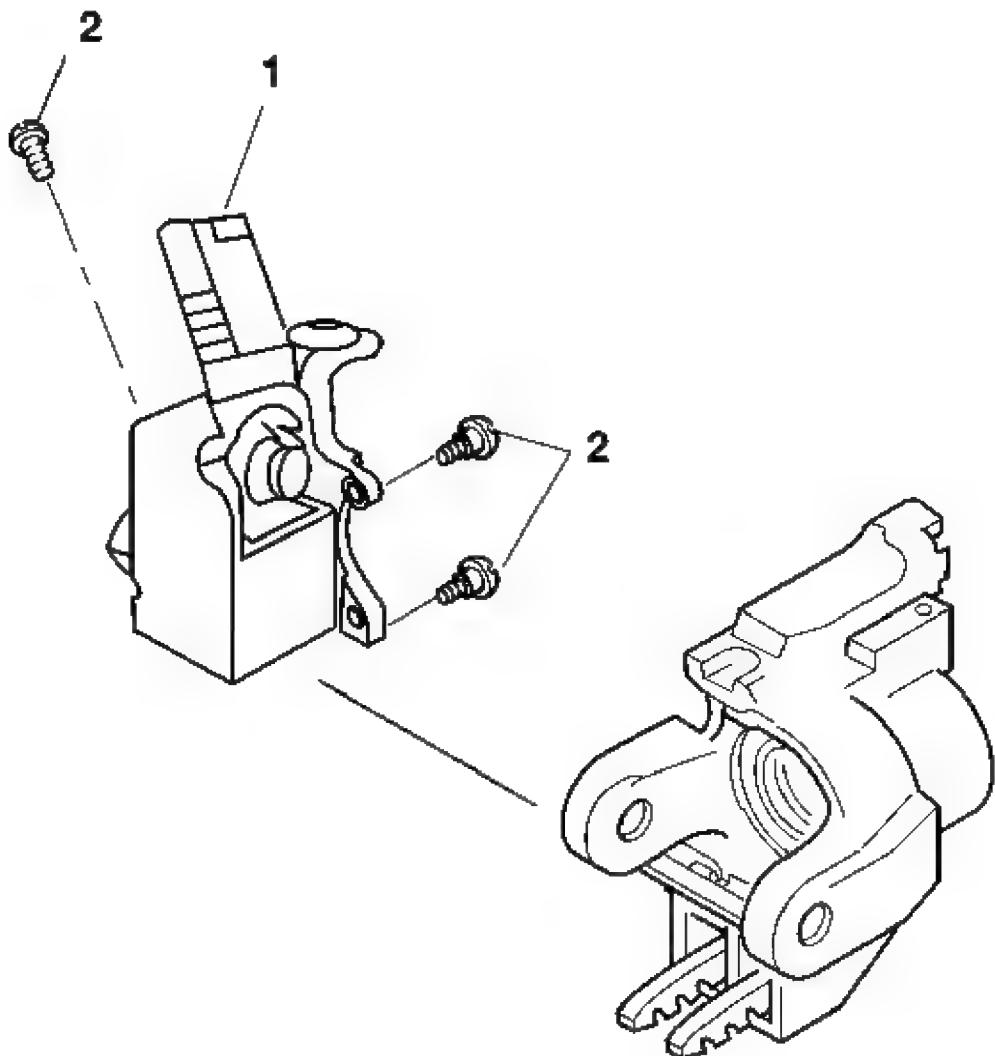


Fig. 37: View Of Ignition Lock Cylinder Case Assembly & Screws
Courtesy of GENERAL MOTORS CORP.

1. Align the ignition lock cylinder case (1) with the steering column tilt head assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

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2. Screw the 3 TORX® screws (2) into the ignition lock cylinder case (1).

Tighten: Tighten the 3 TORX® screws to 7 N.m (62 lb in).

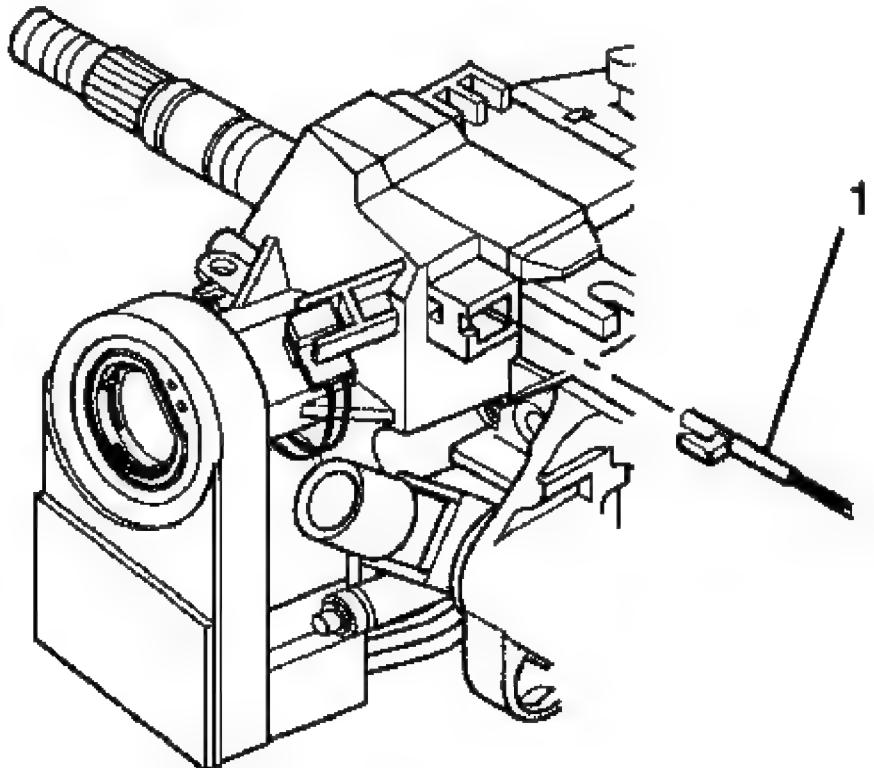


Fig. 38: Identifying Park Lock Cable At Ignition Lock Cylinder
Courtesy of GENERAL MOTORS CORP.

3. Place steering column lock cylinder set into the OFF position.
4. Place the shift lever clevis into the PARK position.
5. Press the locking tab on the end of the park lock cable assembly (1) into the slot in the ignition lock cylinder case.

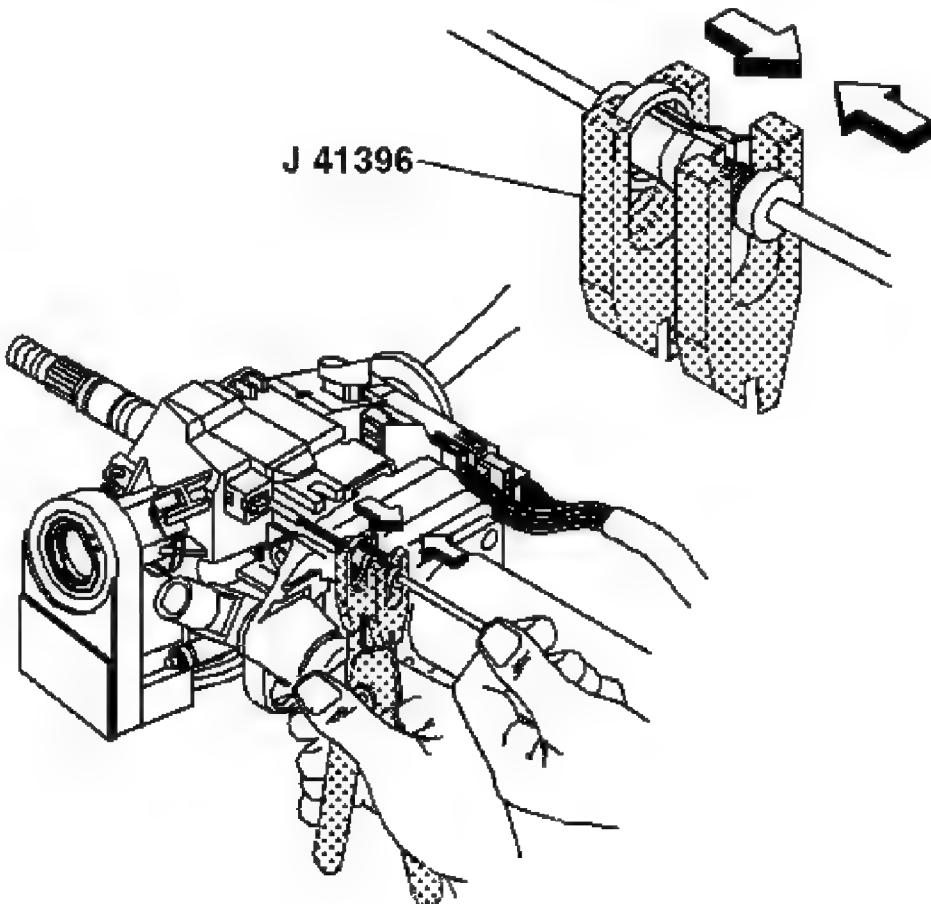


Fig. 39: Adjusting Park Lock Cable Assembly
Courtesy of GENERAL MOTORS CORP.

6. Adjust the park lock cable assembly.
 1. Use the gear shift lever to put the column in the PARK position.
 2. Put the ignition switch in the OFF-LOCK position. Remove the key.
 3. Unlock the adjuster ring on the park lock cable assembly with **J 41396**. See **Special Tools**.
 4. Pull on the cable until the park lock latch contacts the gear shift lever. Release the cable.
 5. Lock the adjuster ring securely in place on the park lock cable assembly with **J 41396**. See **Special Tools**.
7. Inspect the park lock cable assembly.

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1. Using the ignition lock cylinder, put the lock cylinder in the OFF-LOCK position. The gear shift lever should not be able to shift out of the PARK position.
2. Turn the key to the run position and put the gear shift lever in the NEUTRAL position.
3. With the gear shift lever in the NEUTRAL position the lock cylinder should not be able to go into the OFF-LOCK position.
4. Put the gear shift lever in the PARK position.
5. Remove the ignition lock cylinder.

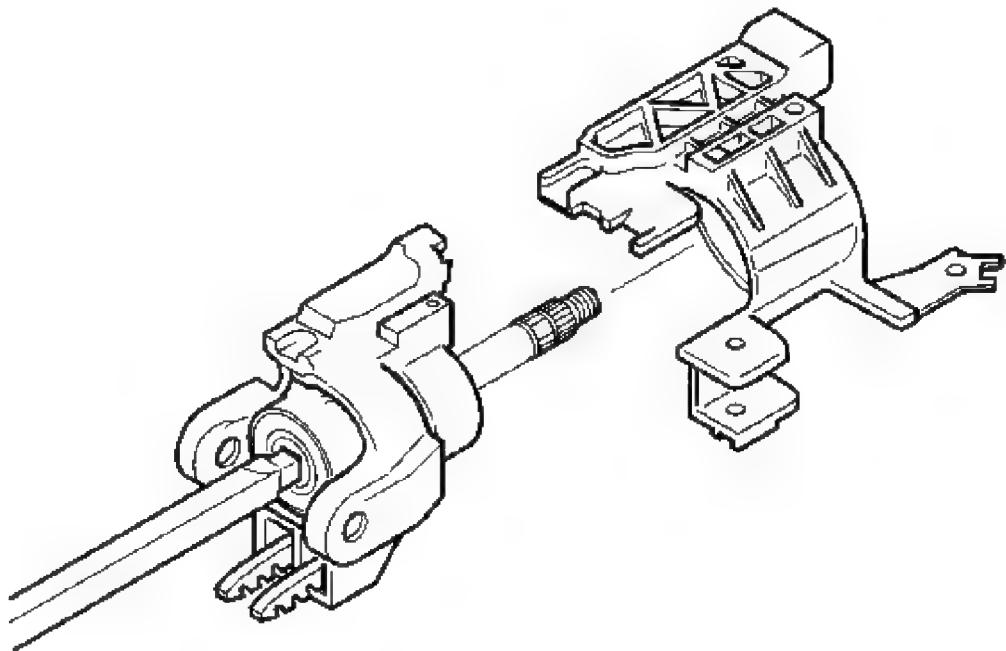


Fig. 40: View Of Turn Signal Switch Housing & Steering Column Shaft Assembly
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Press the turn signal switch housing firmly against the steering column tilt head in order for the screws from the turn signal and multifunction switch assembly to align.

8. Slide the ignition lock cylinder case bracket onto the steering column shaft assembly.
9. Install the turn signal and multifunction switch assembly only. Refer to [Turn Signal Multifunction Switch Replacement](#).
10. Install the steering column tilt head components. Refer to [Steering Column Tilt Head](#)

Housing Replacement.

11. Install the ignition switch only. Refer to [**Ignition and Start Switch Replacement**](#).
12. Install the ignition lock cylinder. Refer to [**Ignition Lock Cylinder Replacement**](#).
13. Enable the SIR system. Refer to [**SIR Disabling and Enabling**](#) in SIR.

IGNITION LOCK CYLINDER SOLENOOID REPLACEMENT

Removal Procedure

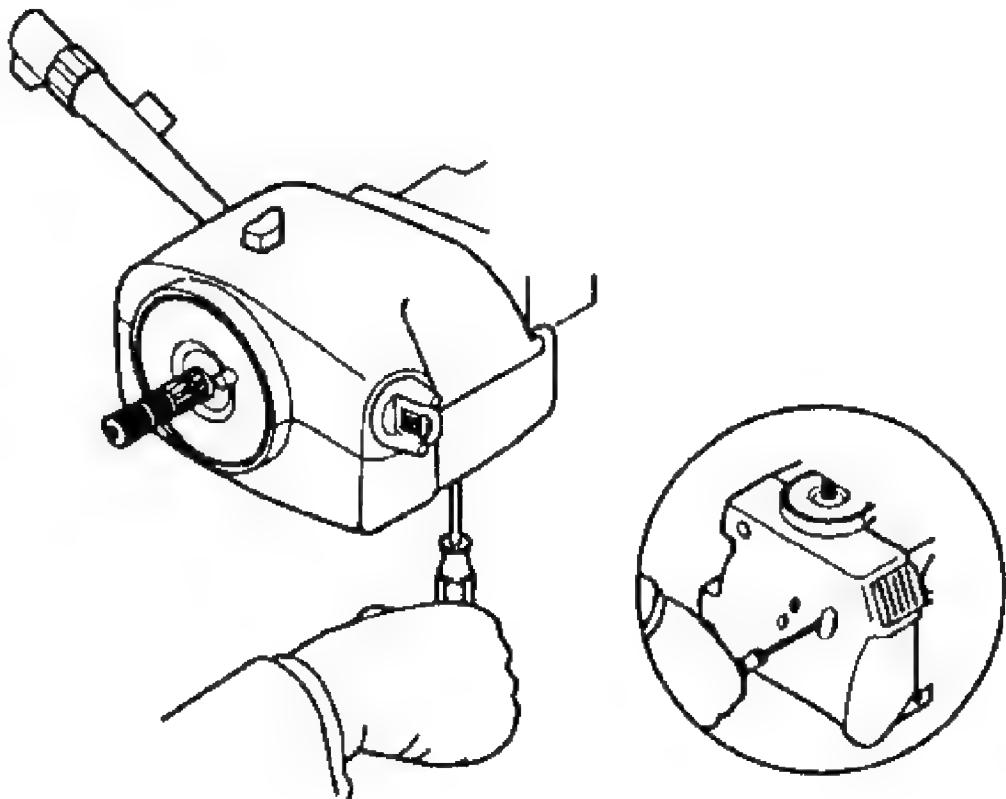


Fig. 41: Pulling Out Filler Plug

Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to [SIR Caution](#) .

1. Disable the SIR coil. Refer to [**SIR Disabling and Enabling**](#).
2. Remove the steering wheel from the column. Refer to [**Steering Wheel Replacement**](#).

3. Inspect the steering column for accident damage. Refer to [Steering Column Accident Damage Inspection](#).
4. Remove the tilt lever. Refer to [Tilt Lever Replacement](#).
5. Place the steering column in the center position.
6. Use a small screwdriver to pull the filler plug out of the bottom of the lower trim cover.

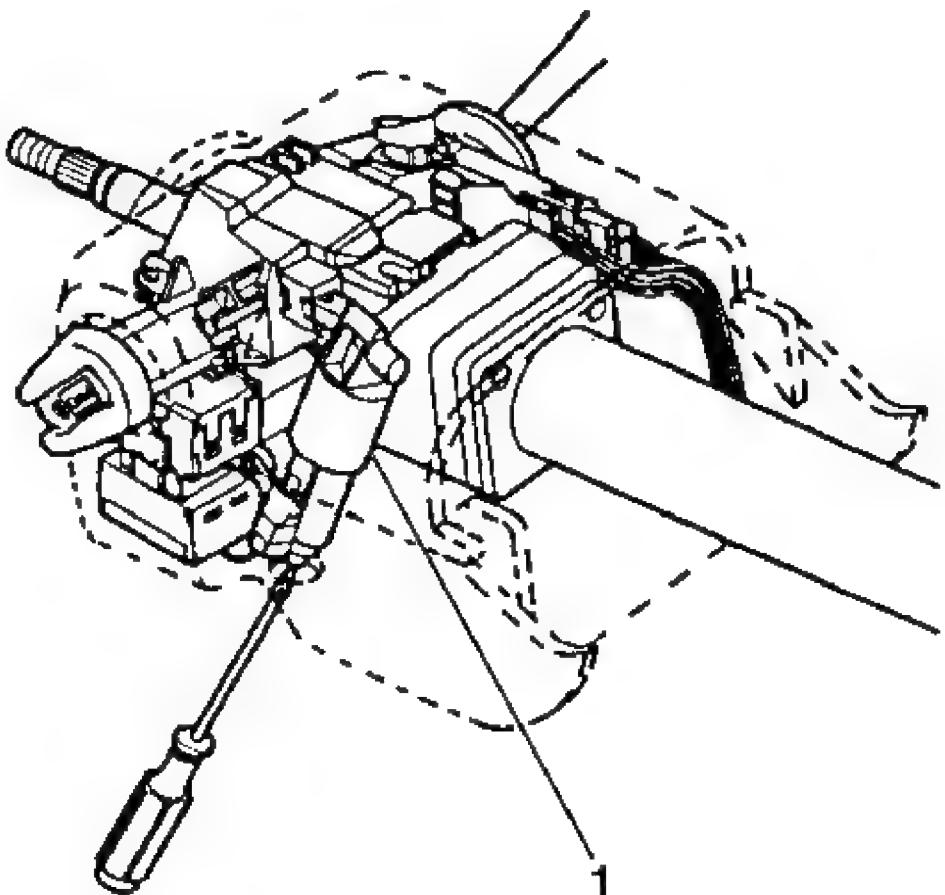


Fig. 42: View Of Steering Wheel Theft Deterrent Lock
Courtesy of GENERAL MOTORS CORP.

7. Insert a small screwdriver into the filler plug hole in the bottom of the lower trim cover.
8. Use the screwdriver to push up on the manual override of the ignition lock cylinder solenoid (1).
9. Turn the key to the lock position. Remove the key.

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10. Remove the ignition lock cylinder. Refer to [Ignition Lock Cylinder Replacement](#).

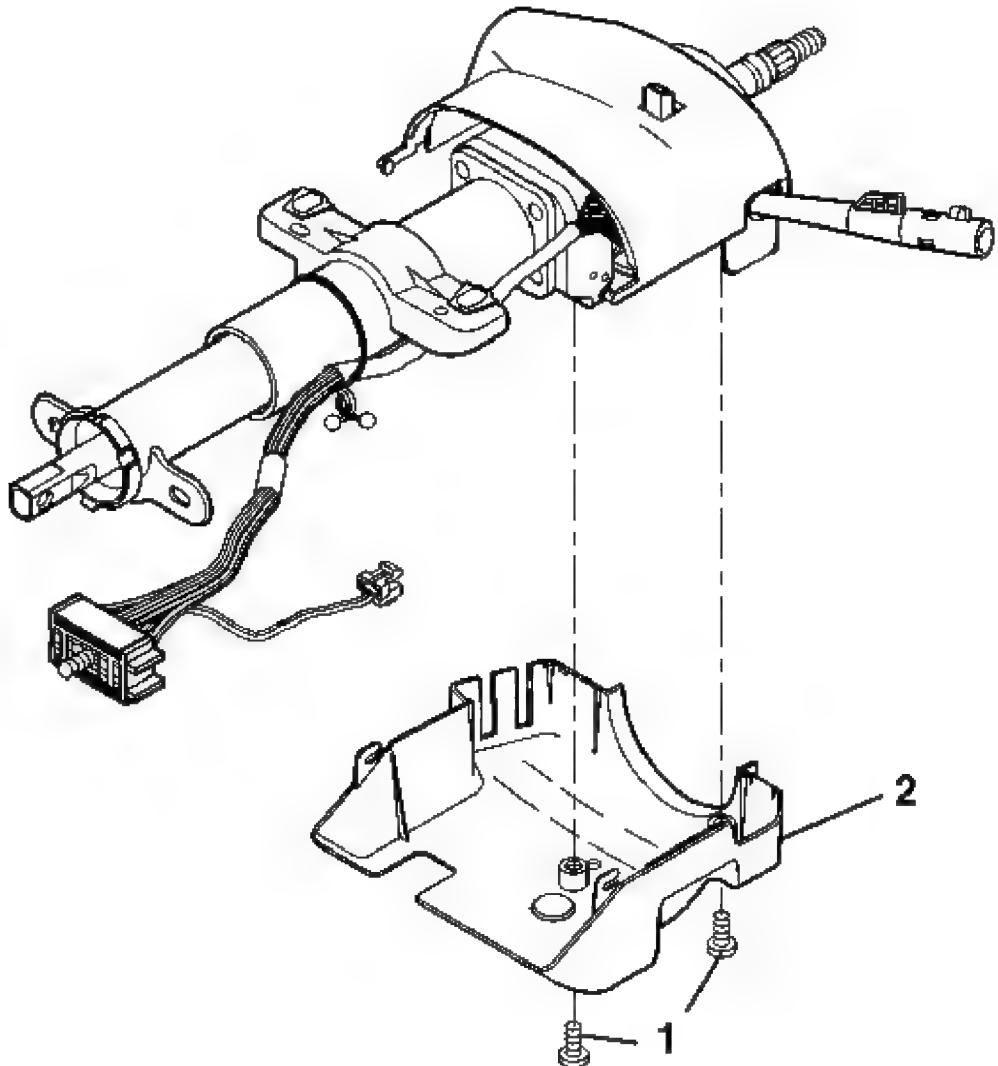


Fig. 43: Lower Column Closeout Trim Cover
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not remove the upper trim cover from the closeout trim cover
Do not remove the closeout trim cover from the I/P.

11. Gently pry the steering column closeout trim cover from the lower trim cover (2).

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12. Remove the 2 pan head tapping screws (1) from the lower trim cover (2).
13. Remove the lower trim cover (2).

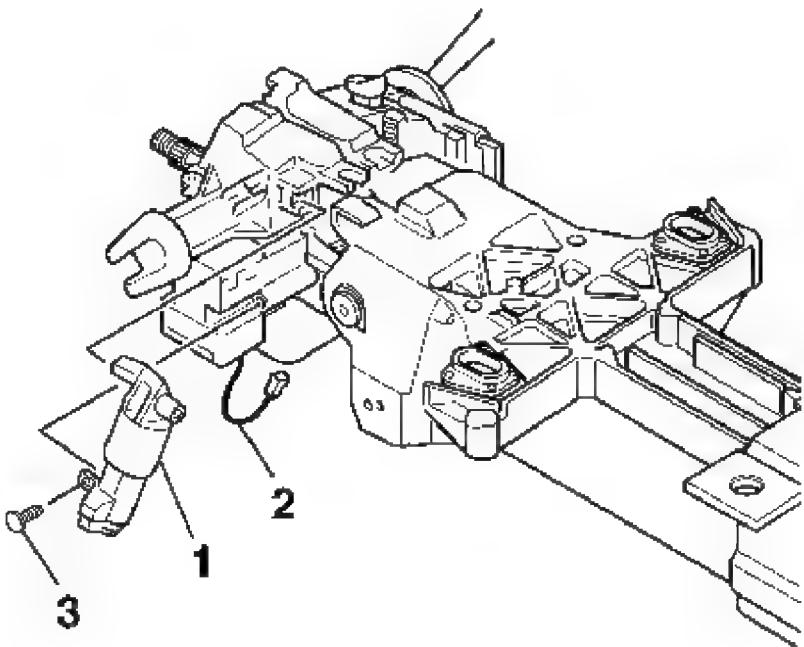


Fig. 44: View Of Theft Deterrent Lock, Black Connector & Screw
Courtesy of GENERAL MOTORS CORP.

14. Gently lift the upper trim cover to gain access to the ignition lock cylinder solenoid (1).
15. Remove the black connector (2) from the ignition lock cylinder solenoid (1).
16. Remove the tapping screw (3) from the ignition lock cylinder solenoid (1) mounting hole and the ignition switch assembly.
17. Pry the ignition lock cylinder solenoid (1) off of the ignition lock cylinder case assembly.

Installation Procedure

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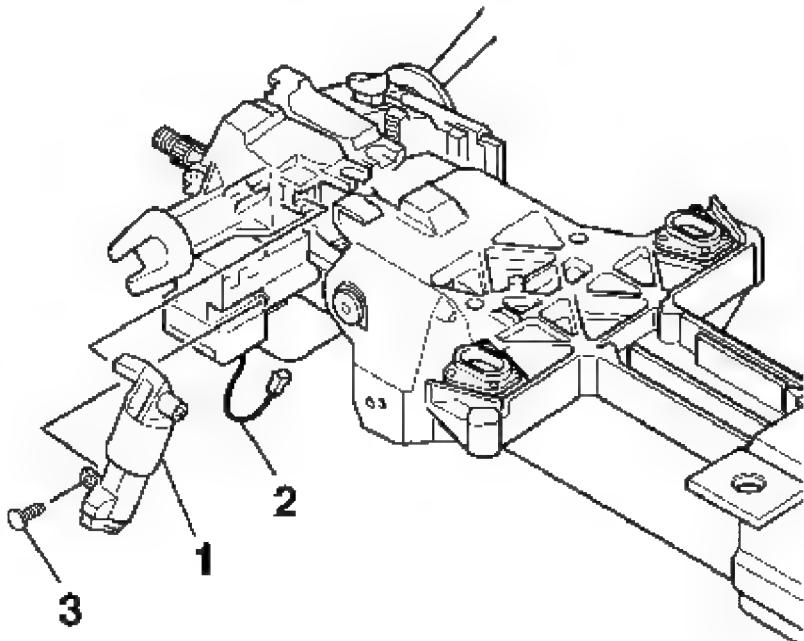


Fig. 45: View Of Theft Deterrent Lock, Black Connector & Screw
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Do not remove the upper shroud from the closeout trim cover

Do not remove the closeout trim cover from the I/P.

1. Snap the ignition lock cylinder solenoid (1) onto the ignition lock cylinder case assembly.
2. Install the tapping screw (3) into the mounting hole of the ignition lock cylinder solenoid (1) and the ignition switch assembly.
3. Install the ignition lock cylinder. Refer to [Ignition Lock Cylinder Replacement](#).
4. Install the black connector into the ignition lock cylinder solenoid (1).

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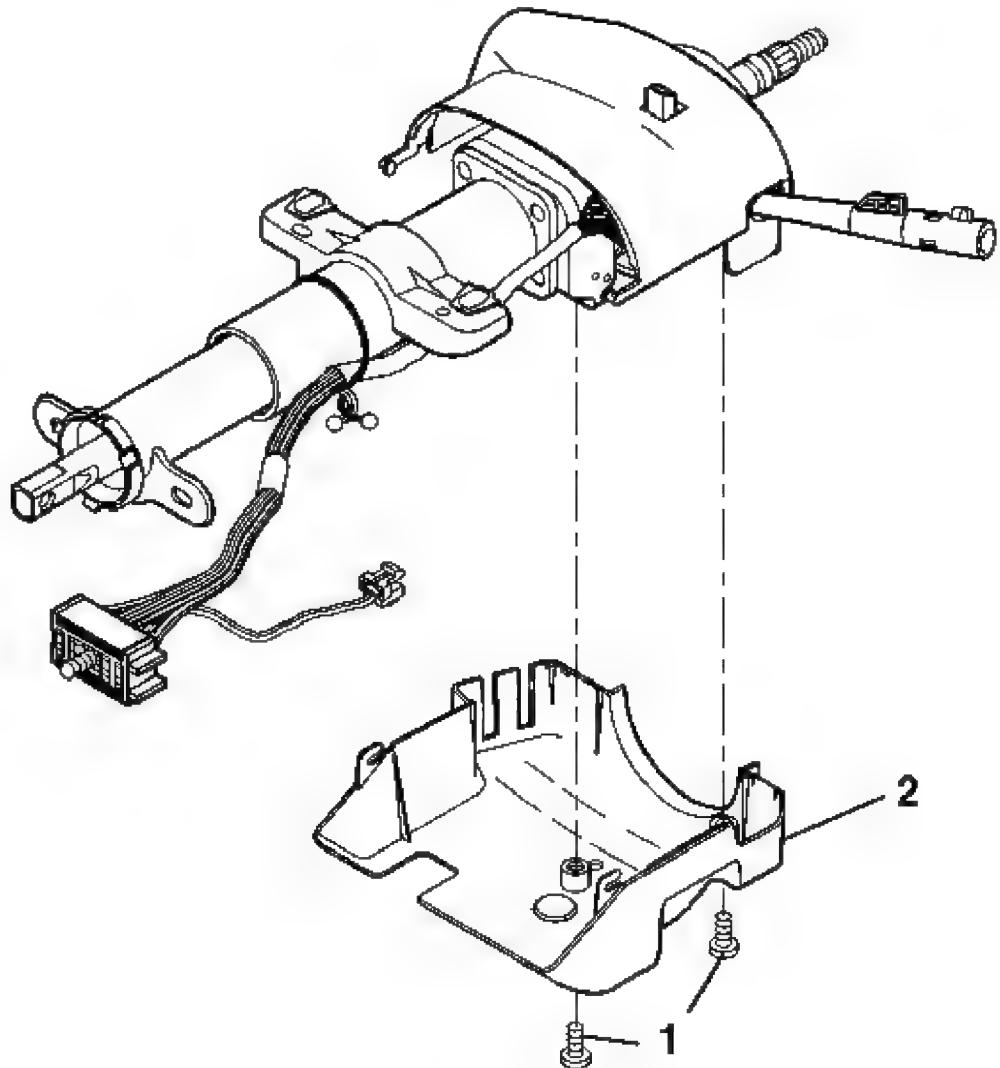


Fig. 46: Removing/Installing Lower Trim Cover
Courtesy of GENERAL MOTORS CORP.

5. Install the lower trim cover (2) onto the steering column.
6. Attach the closeout trim cover to the lower trim cover (2).

NOTE: Refer to Fastener Notice.

7. Install the 2 pan head tapping screws (1) to the lower trim cover (2).

Tighten: Tighten the screws to 3 N.m (27 lb in).

CAUTION: Refer to SIR Inflator Module Coil Caution .

8. Install the steering wheel onto the steering column. Refer to Steering Wheel Replacement.
9. Install the tilt lever. Refer to Tilt Lever Replacement
10. Enable the SIR system. Refer to SIR Disabling and Enabling .

TURN SIGNAL MULTIFUNCTION SWITCH REPLACEMENT

Removal Procedure

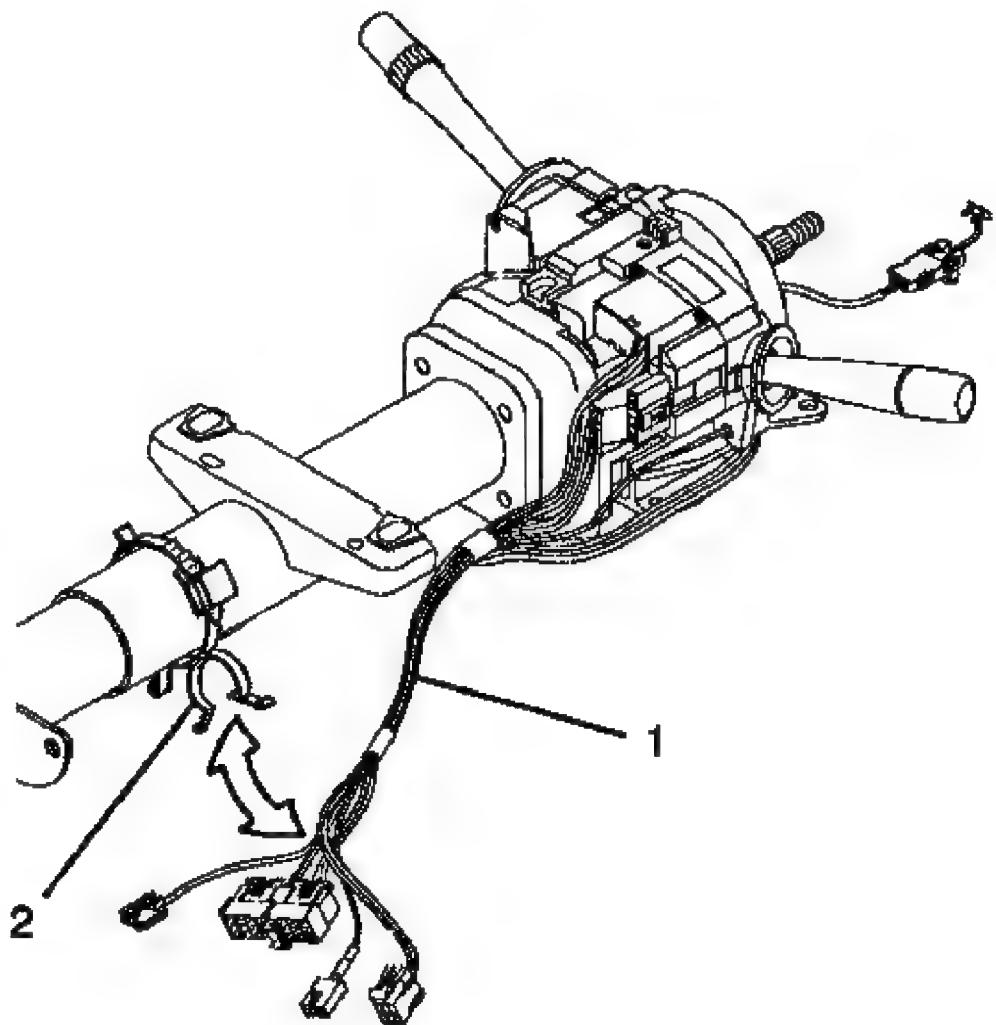


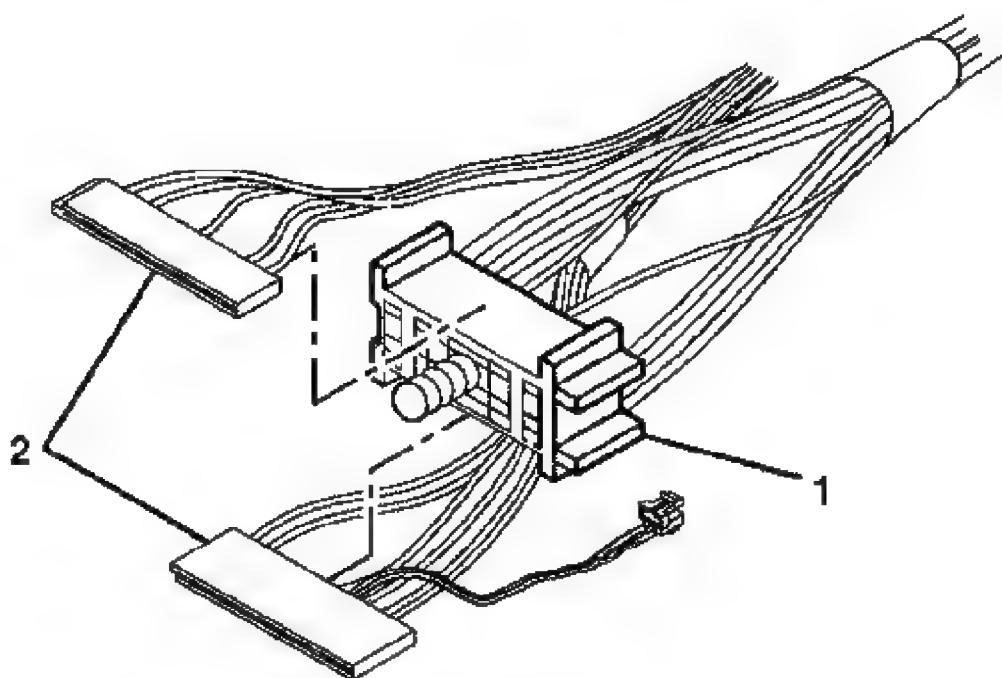
Fig. 47: View Of Steering Column Wire Harness Assembly & Wire Harness Strap
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the SIR system. Refer to SIR Disabling and Enabling in SIR.
2. Remove the steering wheel. Refer to Steering Wheel Replacement.
3. Remove the upper and lower trim covers. Refer to Steering Column Trim Covers Replacement.

IMPORTANT: The abrasion sleeve located on the steering column wire harness assembly must be reinstalled. Make note of what connector is coming out of the abrasion sleeve for installation purposes.

4. Remove the wire harness assembly (1) from the wire harness strap (2).
5. Disconnect the turn signal and multifunction switch assembly connector from the SIR system coil connector.



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Fig. 48: Turn Signal & Multifunction Switch Assembly Connectors
Courtesy of GENERAL MOTORS CORP.

6. Slide the 2 connectors (2) of the turn signal and multifunction switch assembly out of the bulkhead connector (1).

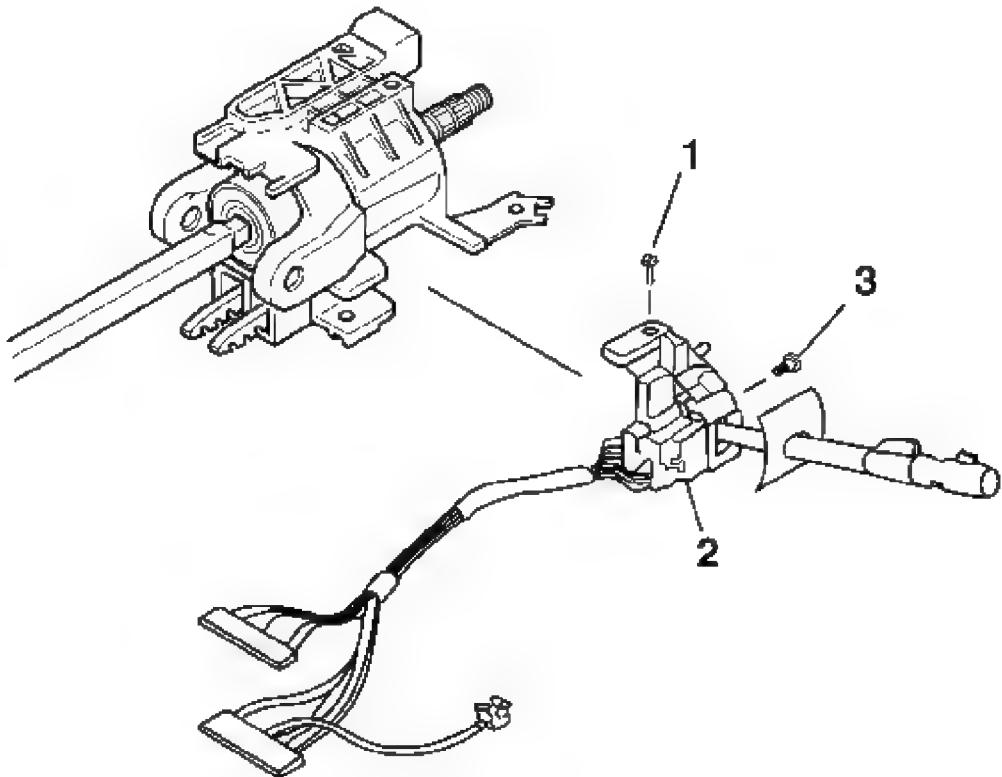


Fig. 49: View Of Turn Signal & Multifunction Switch Assembly
Courtesy of GENERAL MOTORS CORP.

7. Remove the 2 pan head tapping screws (1) and (3) from the turn signal and multifunction switch assembly (2).
8. Remove the turn signal and multifunction switch assembly (2) from the steering column tilt head assembly.

Installation Procedure

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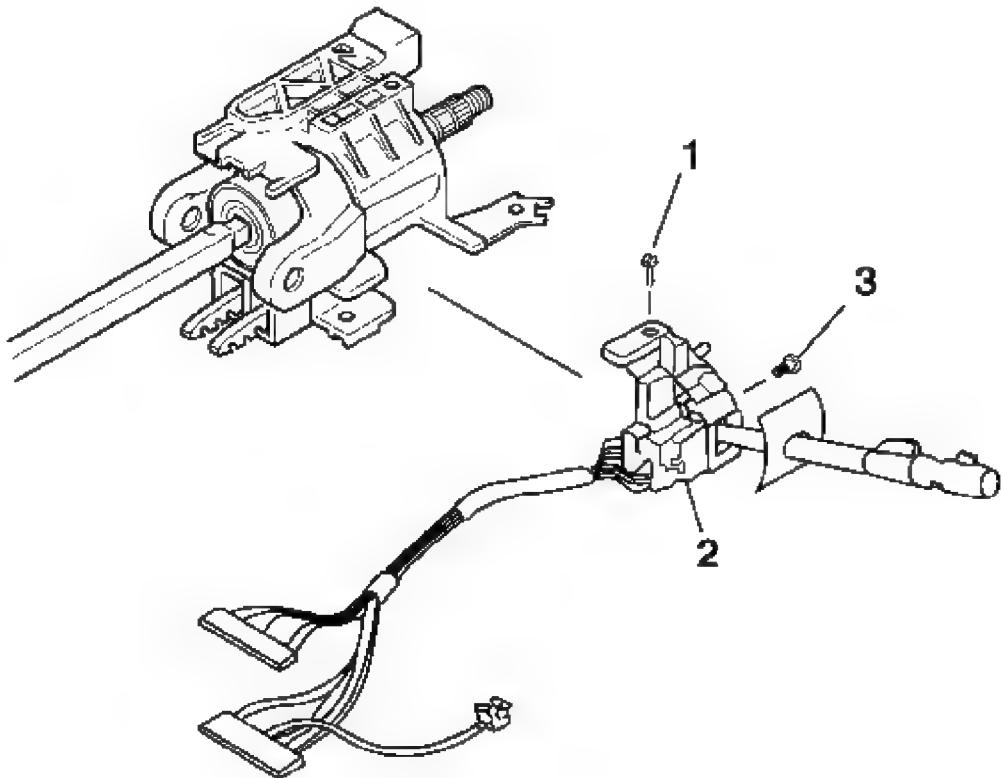


Fig. 50: View Of Turn Signal & Multifunction Switch Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the turn signal and multifunction switch assembly (2) onto the steering column tilt head assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: Be sure that the electrical contact of the turn signal and multifunction switch assembly (2) rests on the turn signal cancel cam assembly.

2. Screw the 2 pan head tapping screws (1) and (3) into the turn signal and multifunction assembly (2).

Tighten

- Tighten the top pan head tapping screw (1) to 3 N.m (27 lb in).

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- Tighten the side pan head tapping screw (3) to 7 N.m (62 lb in).

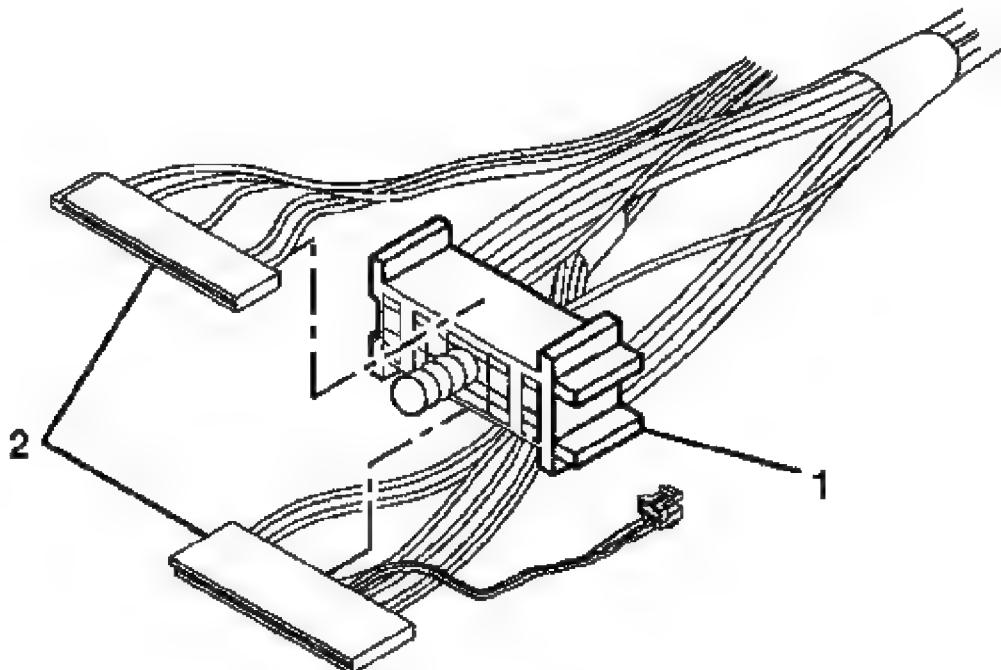


Fig. 51: Turn Signal & Multifunction Switch Assembly Connectors
Courtesy of GENERAL MOTORS CORP.

3. Slide the 2 connectors (2) of the turn signal and multifunction switch assembly into the bulkhead connector (1).

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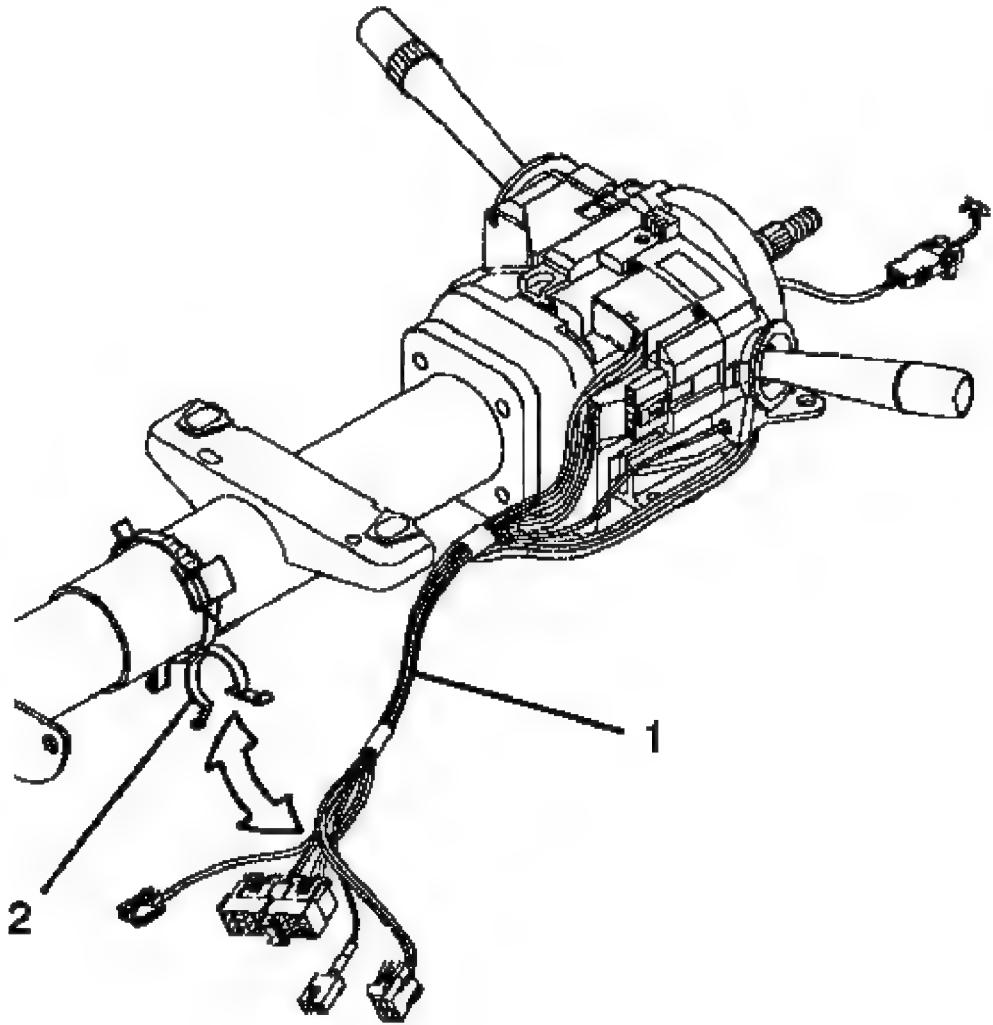


Fig. 52: View Of Steering Column Wire Harness Assembly & Wire Harness Strap
Courtesy of GENERAL MOTORS CORP.

4. Connect the turn signal and multifunction switch assembly connector to the SIR coil connector.

IMPORTANT: The abrasion sleeve must be installed back onto the steering column wire harness assembly. The ignition lock cylinder case wires and connector must be hanging out of the middle of the abrasion sleeve.

5. Install the wire harness assembly (1) into the wire harness strap (2).

6. Install the upper and lower trim covers. Refer to [Steering Column Trim Covers Replacement](#).
7. Install the steering wheel. Refer to [Steering Wheel Replacement](#).
8. Enable the SIR system. Refer to [SIR Disabling and Enabling](#) in SIR.

SHIFT LEVER REPLACEMENT

Removal Procedure

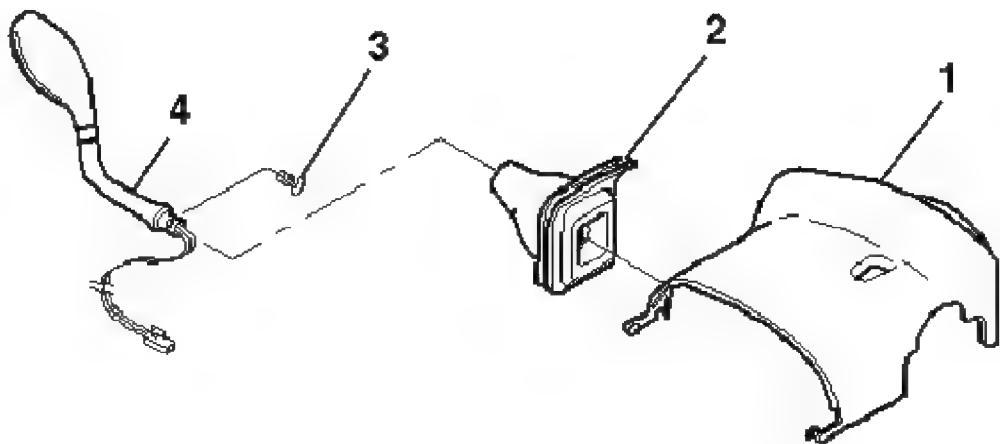


Fig. 53: View Of Shift Lever, Seal (Boot), Screw & Upper Trim Cover
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to [SIR Caution in Cautions and Notices](#).

1. Disable the SIR system. Refer to [SIR Disabling and Enabling](#) in SIR.
2. Slide the shift lever seal (2) up the shift lever (4).
3. If necessary, remove the steering column trim covers. Refer to [Steering Column Trim Covers Replacement](#).
4. Disconnect the shift lever connector at the base of the column.
5. Remove the shift lever screw (3) from the shift lever assembly (4).
6. Remove the shift lever and seal from the linear shift assembly.

IMPORTANT: The shift lever seal must be removed by sliding the shift

lever seal towards the narrow portion of the shift lever.

7. Remove the shift lever seal (2) from the shift lever (4).

Installation Procedure

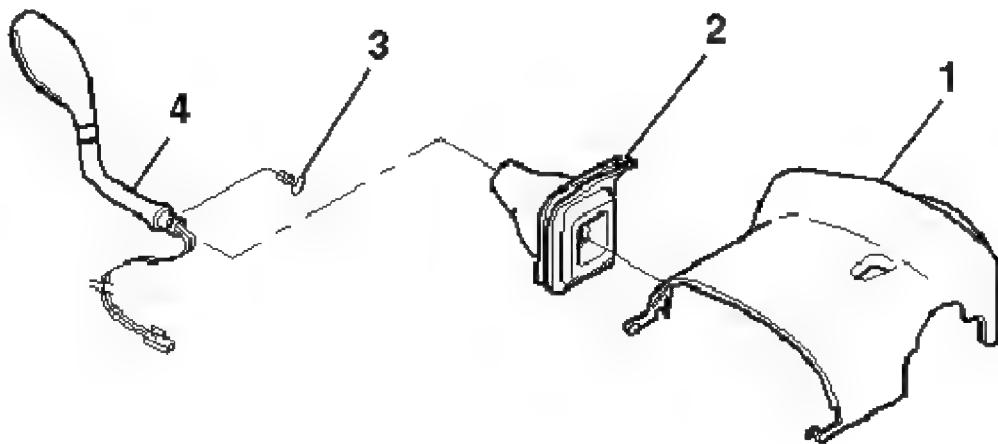


Fig. 54: View Of Shift Lever, Seal (Boot), Screw & Upper Trim Cover
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The shift lever seal must be installed to the narrow end of the shift lever.

1. Install the shift lever seal (2) onto the shift lever assembly (4).
2. Install the shift lever assembly (4) to linear shift assembly.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the shift lever screw (3) into the shift lever assembly (4).

Tighten: Tighten the screw to 20 N.m (15 lb ft).

4. Slide the shift lever seal (2) down the shift lever assembly (4).
5. Align the shift lever seal into the steering column trim covers.
6. If necessary, install the steering column trim covers. Refer to Steering Column Trim Covers Replacement.

7. Enable the SIR system. Refer to **SIR Disabling and Enabling** in SIR.

LINEAR SHIFT ASSEMBLY REPLACEMENT

Removal Procedure

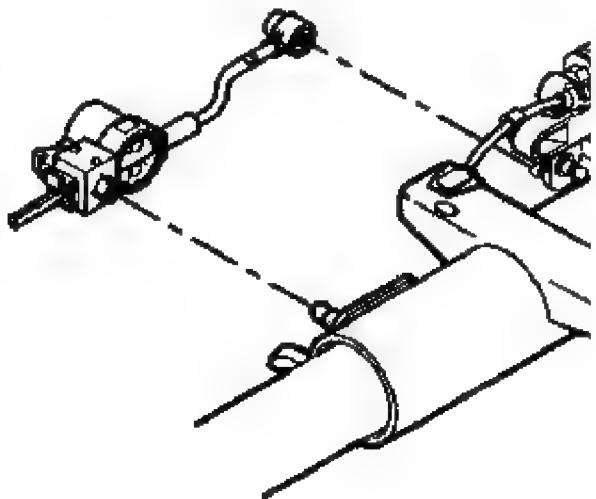


Fig. 55: View Of Automatic Transmission Shift Lock Control Actuator
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution .

1. Disable the SIR system. Refer to **SIR Disabling and Enabling** .
2. Remove the upper and lower trim covers. Refer to **Steering Column Trim Covers Replacement**.
3. Remove the shift lever assembly. Refer to **Shift Lever Replacement**.
4. With a screwdriver carefully pry the automatic transmission shift lock control away from the steering column jacket.

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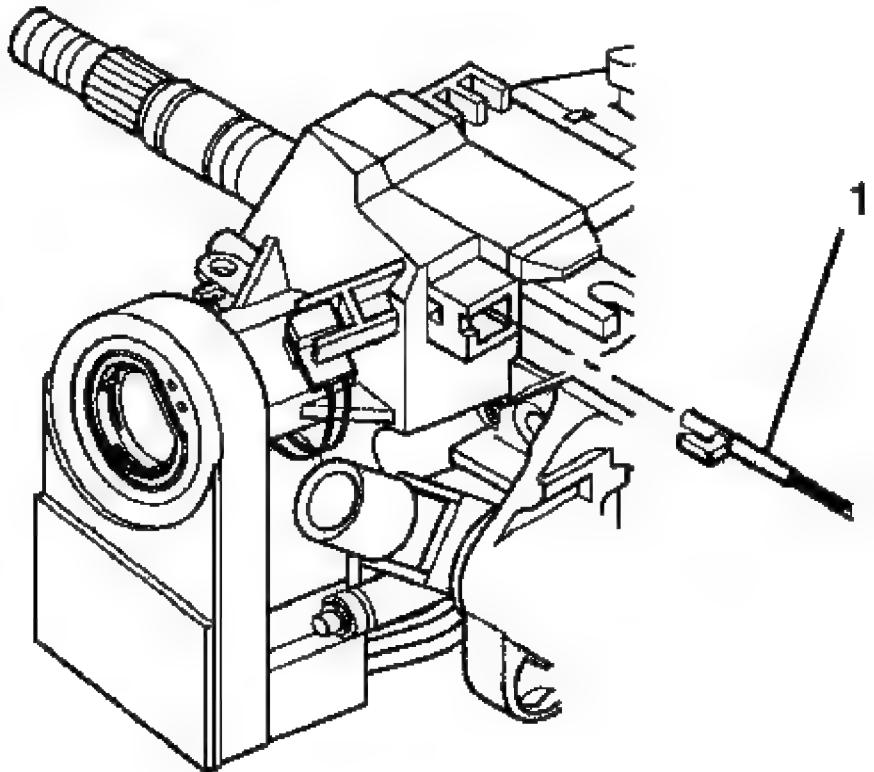


Fig. 56: Identifying Park Lock Cable At Ignition Lock Cylinder
Courtesy of GENERAL MOTORS CORP.

5. The lock cylinder should be in the OFF-LOCK position.

IMPORTANT: Do NOT remove the tape on the park lock cable. If the tape is removed from the park lock cable, you MUST order a new linear shift assembly.

6. Insert a small screwdriver into the slot on the ignition lock cylinder case and push against the locking tab to remove the park lock cable assembly (1).

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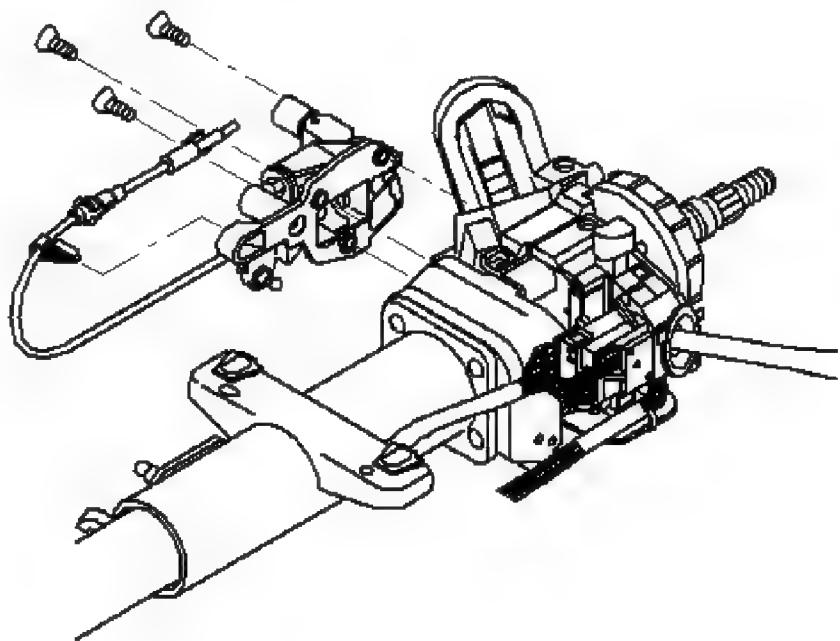


Fig. 57: Flat-Head 6-Lobed Socket Tap Screws & Linear Shift Assembly
Courtesy of GENERAL MOTORS CORP.

7. Remove the 3 flat-head 6-lobed socket tap screws from the linear shift assembly.
8. Remove the linear shift assembly.

Installation Procedure

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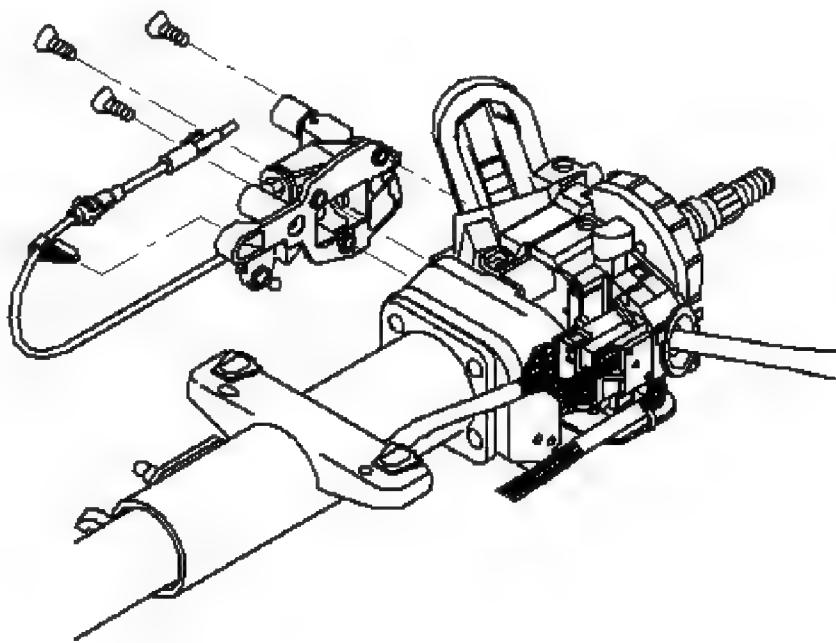


Fig. 58: Flat-Head 6-Lobed Socket Tap Screws & Linear Shift Assembly
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice.

IMPORTANT: Do NOT remove the tape on the park lock cable. If so, the linear shift assembly MUST be replaced.

1. Install the linear shift assembly and secure by using 3 flat-head 6-lobed socket tap screws.

The linear shift assembly must be out of the PARK position to install the lower socket tap screw.

Tighten: Tighten the screws to 5 N.m (44 lb in).

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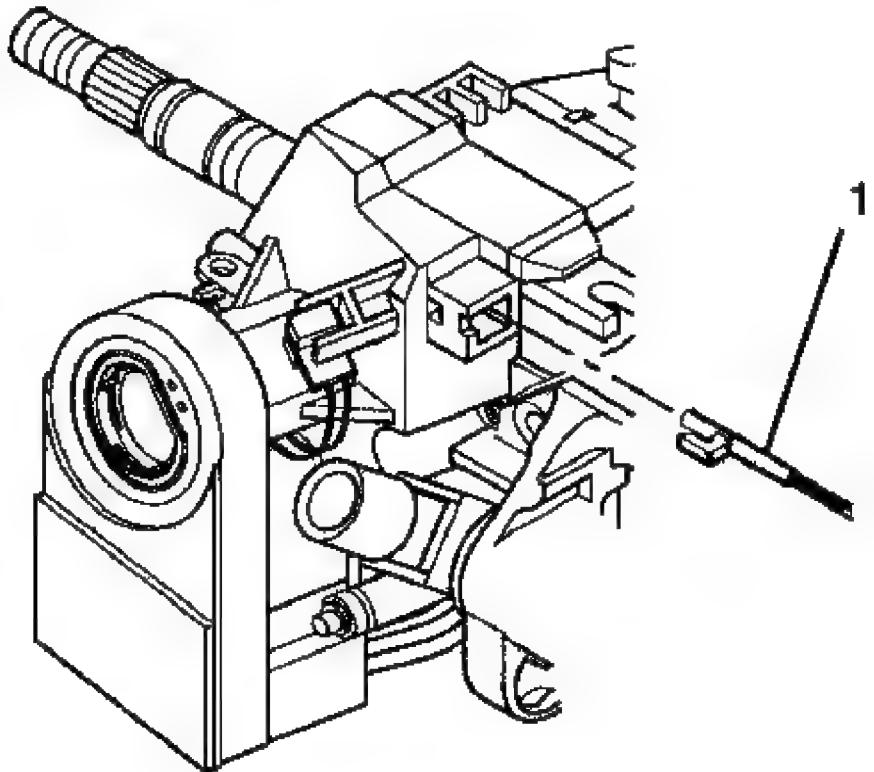


Fig. 59: Identifying Park Lock Cable At Ignition Lock Cylinder
Courtesy of GENERAL MOTORS CORP.

2. Connect the park lock cable assembly (1) into the ignition lock cylinder case.
 - The lock cylinder should be in the OFF-LOCK position.
 - The locking tab at the end of the park lock cable assembly (1) must be installed into the ignition lock cylinder case.

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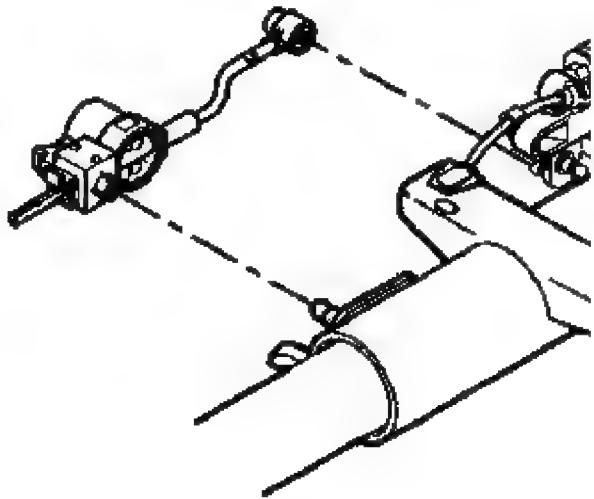


Fig. 60: View Of Automatic Transmission Shift Lock Control Actuator
Courtesy of GENERAL MOTORS CORP.

3. Install the automatic transmission shift lock control.
4. Install the gear shift lever and put the column in the NEUTRAL position.

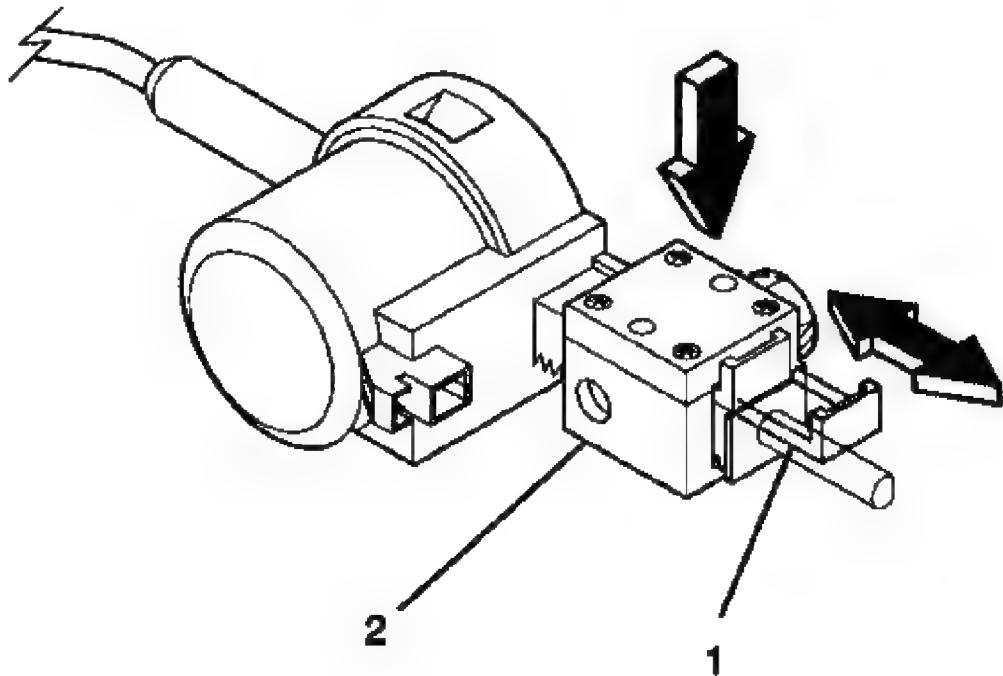


Fig. 61: Adjusting Automatic Transmission Shift Lock Control Actuator
Courtesy of GENERAL MOTORS CORP.

5. Adjust the automatic transmission shift lock control.
 1. Pull the tab (1) out on the block side (2) of the automatic transmission shift lock control.
 2. Press on the adjuster block (2) to compress the internal adjuster spring to disengage the adjuster teeth. Slide the adjuster block as far away from the solenoid as possible.
 3. Lock in place by pushing the tab (1) back in.
6. Inspect the automatic transmission shift lock control.
 1. The automatic transmission shift lock control must lock the gear shift lever when it is put into the PARK position.
 2. When the column is installed in the vehicle you will not be able to shift the gear shift lever out of the PARK position without pressing on the brake pedal. The solenoid will be energized.
 3. Readjust if needed.
7. Install the shift lever assembly. Refer to [Shift Lever Replacement](#).
8. Install the upper and lower trim covers. Refer to [Steering Column Trim Covers](#)

Replacement.

9. Enable the SIR system. Refer to [SIR Disabling and Enabling](#).

TILT LEVER REPLACEMENT

Removal Procedure

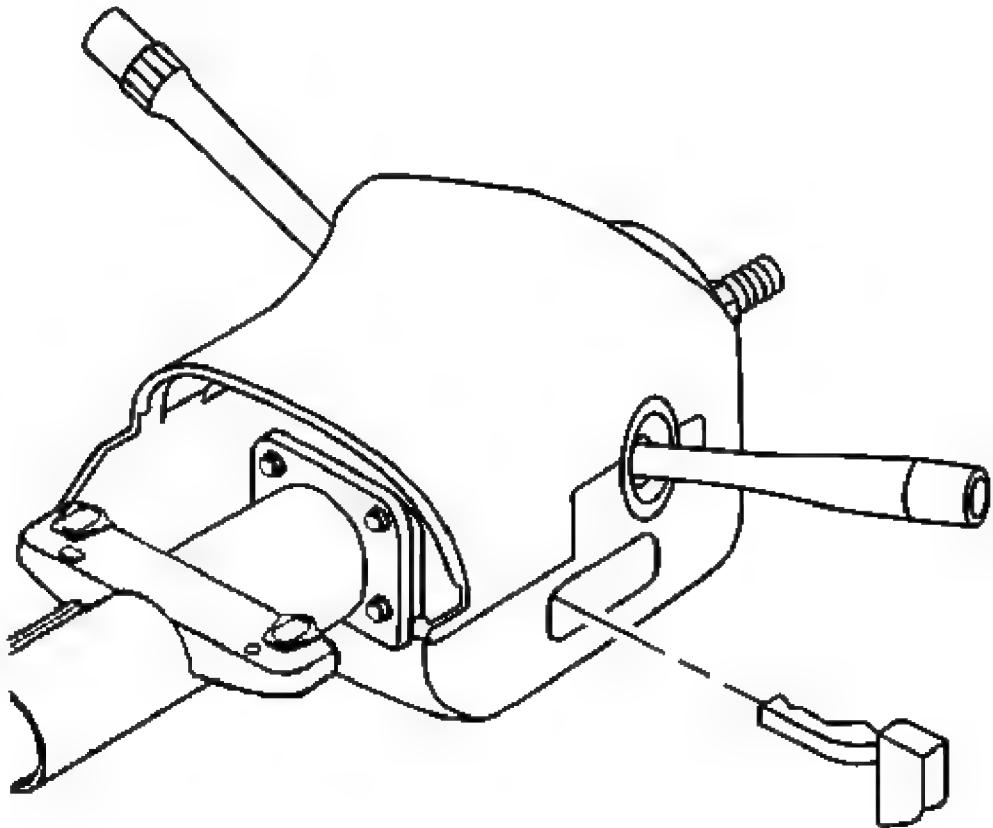


Fig. 62: Removing/Installing Tilt Lever
Courtesy of GENERAL MOTORS CORP.

1. Grasp the tilt lever.
2. Pull the tilt lever straight out from the steering column.

Installation Procedure

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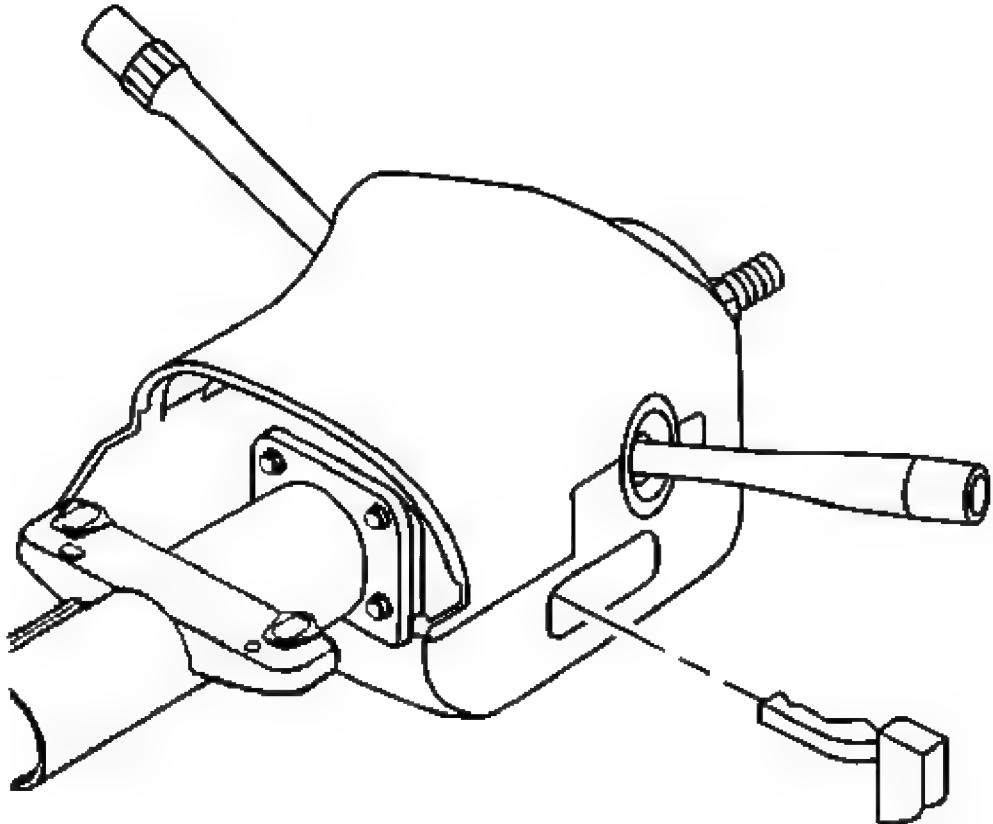
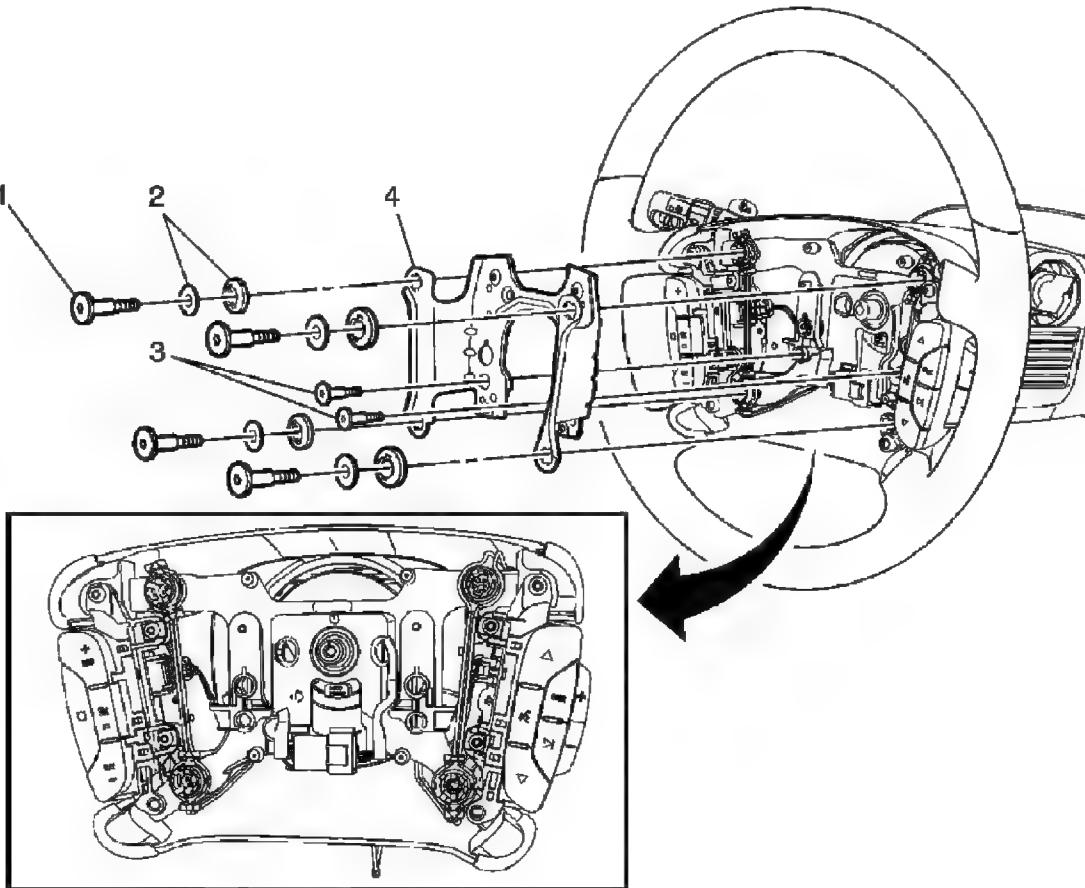


Fig. 63: Removing/Installing Tilt Lever
Courtesy of GENERAL MOTORS CORP.

1. Align the tilt lever into the steering column.
2. Slide the tilt lever handle into the steering column until the handle locks into position.

HORN SWITCH REPLACEMENT

**Fig. 64: Removing/Installing Horn Switch**

Courtesy of GENERAL MOTORS CORP.

Horn Switch Replacement

Callout	Component Name
NOTE: Refer to <u>Fastener Notice</u> .	
Fastener Tightening Specifications: Refer to <u>Fastener Tightening Specifications</u> . Preliminary Procedure: Remove the inflatable restraint steering wheel module. Refer to <u>Inflatable Restraint Steering Wheel Module Replacement</u> .	
1	Steering Wheel Horn Switch Bolts (Qty: 4) Tip: Hand start the bolts on installation to avoid cross threading. Tighten: 7 N.m (62 lb in)
2	Steering Wheel Horn Switch Washers (Qty: 4)
3	Steering Wheel Horn Switch Screws (Qty: 2) Tip: Hand start the screws on installation to avoid cross threading.

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Tighten: 5 N.m (44 lb in)

4

Steering Wheel Horn Switch Assembly

Tip: Disconnect the horn switch electrical.

STEERING WHEEL CONTROL SWITCH ASSEMBLY REPLACEMENT

Removal Procedure

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the SIR system. Refer to **SIR Disabling and Enabling** in SIR.
2. Remove the steering wheel. Refer to **Steering Wheel Replacement**.

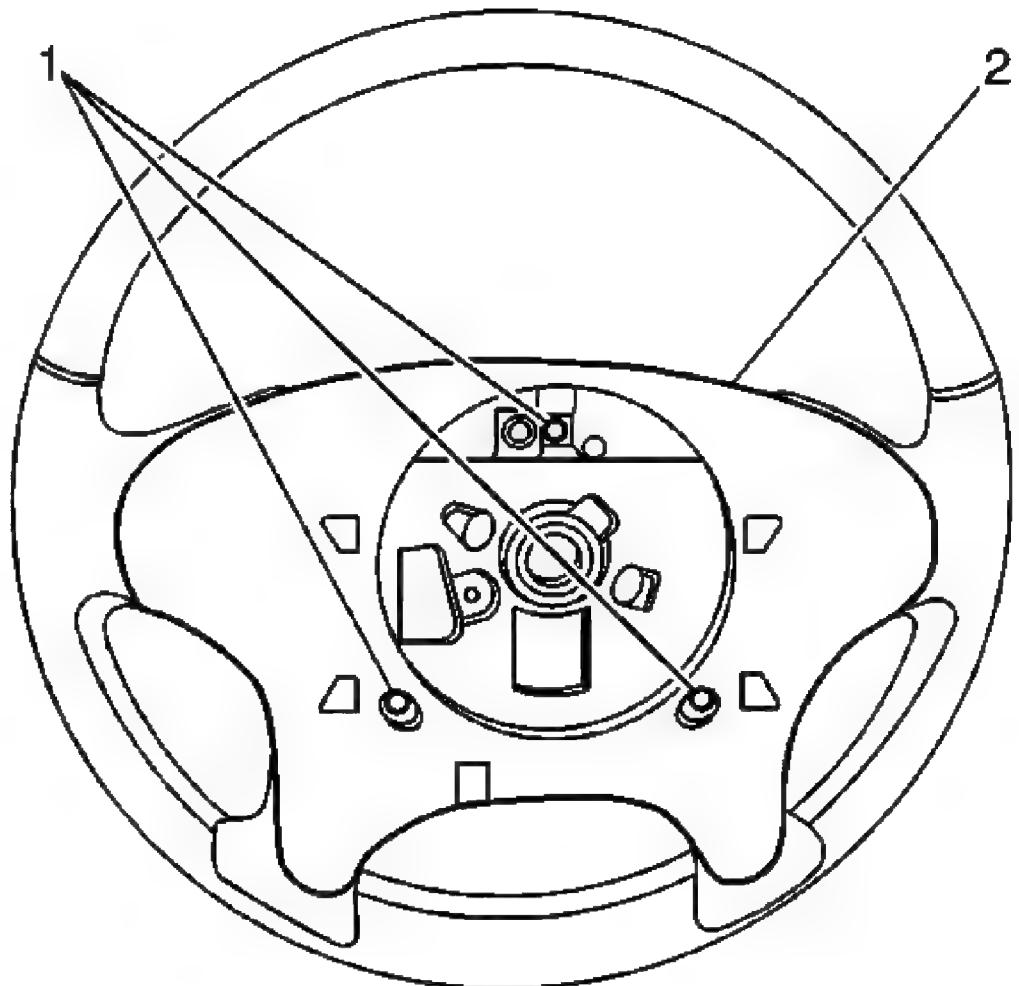


Fig. 65: View of Steering Wheel Bezel & Retaining Screws
Courtesy of GENERAL MOTORS CORP.

3. Remove the retaining screws (1) from the steering wheel bezel.
4. Remove the steering wheel bezel (2).

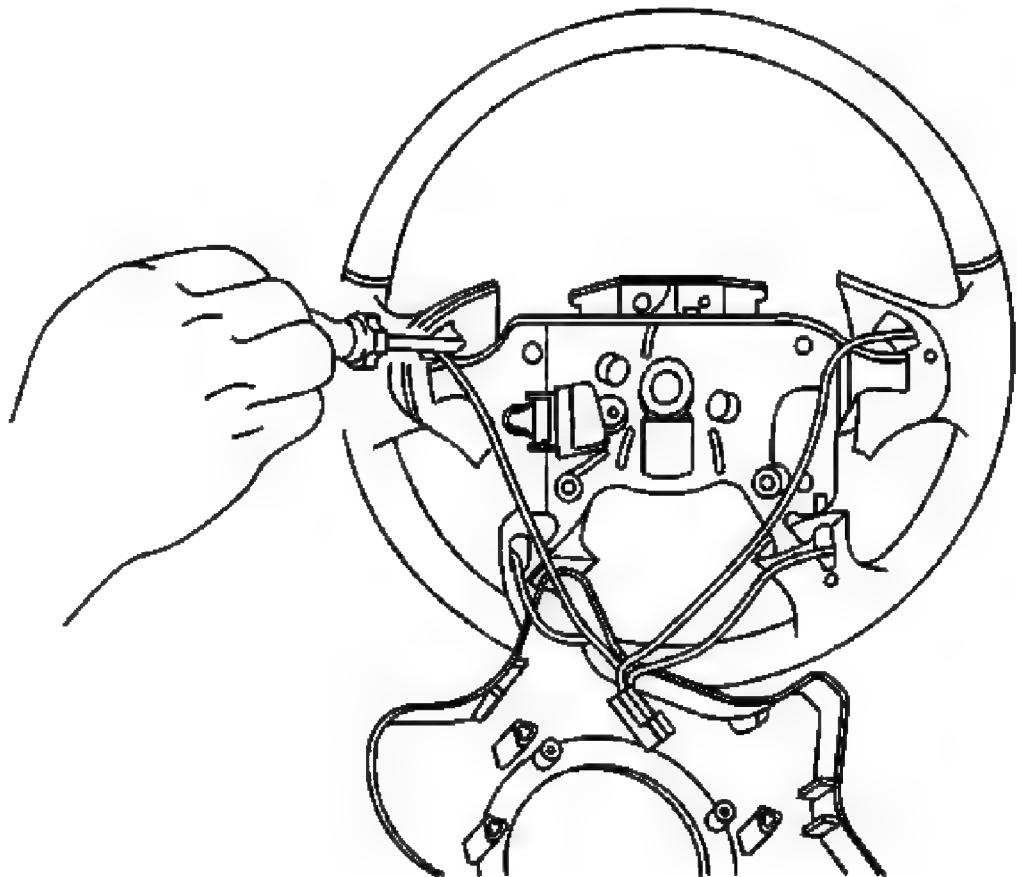


Fig. 66: Removing Switch From Steering Wheel With Small Blunt Ended Tool
Courtesy of GENERAL MOTORS CORP.

5. Insert a small, blunt ended tool into the access hole in the back of the steering wheel in order to push the switch out of the steering wheel.
6. Disconnect the electrical connector.

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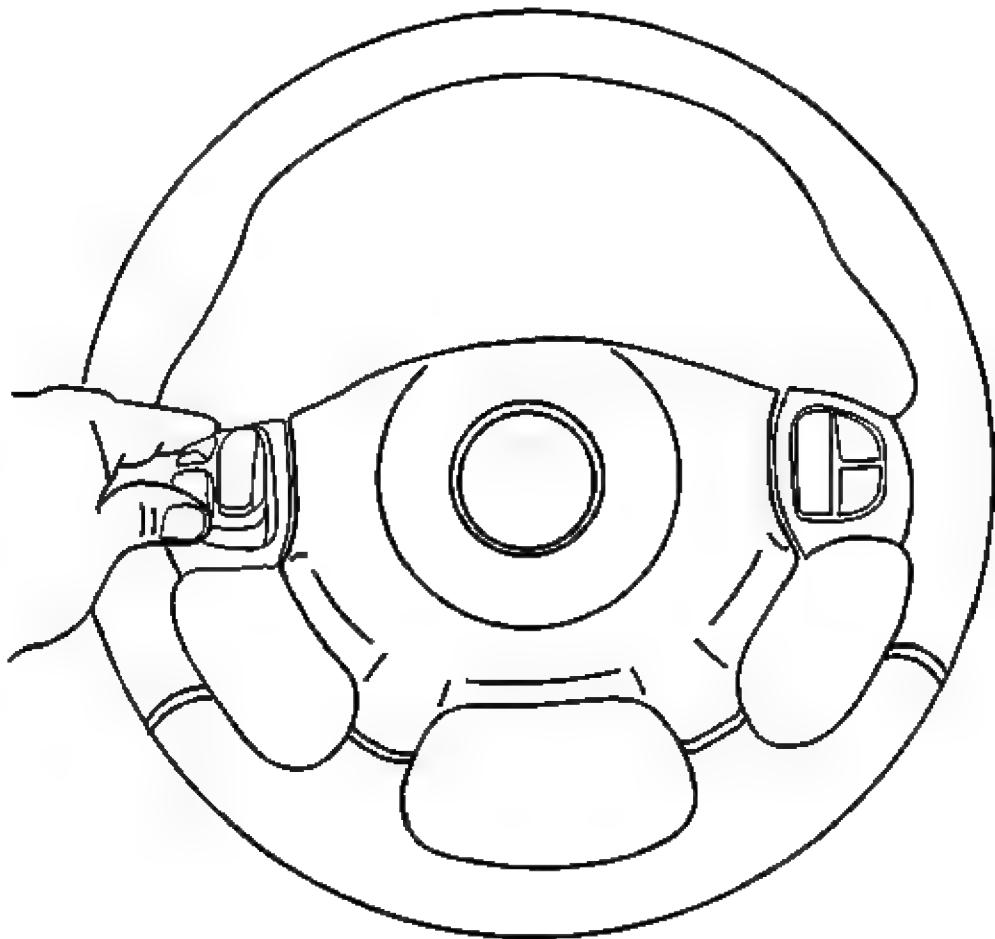


Fig. 67: Installing Switch into Steering Wheel

Courtesy of **GENERAL MOTORS CORP.**

1. Connect the electrical connector.
2. Align the switch to the switch opening in the steering wheel.
3. Snap the switch into the steering wheel.

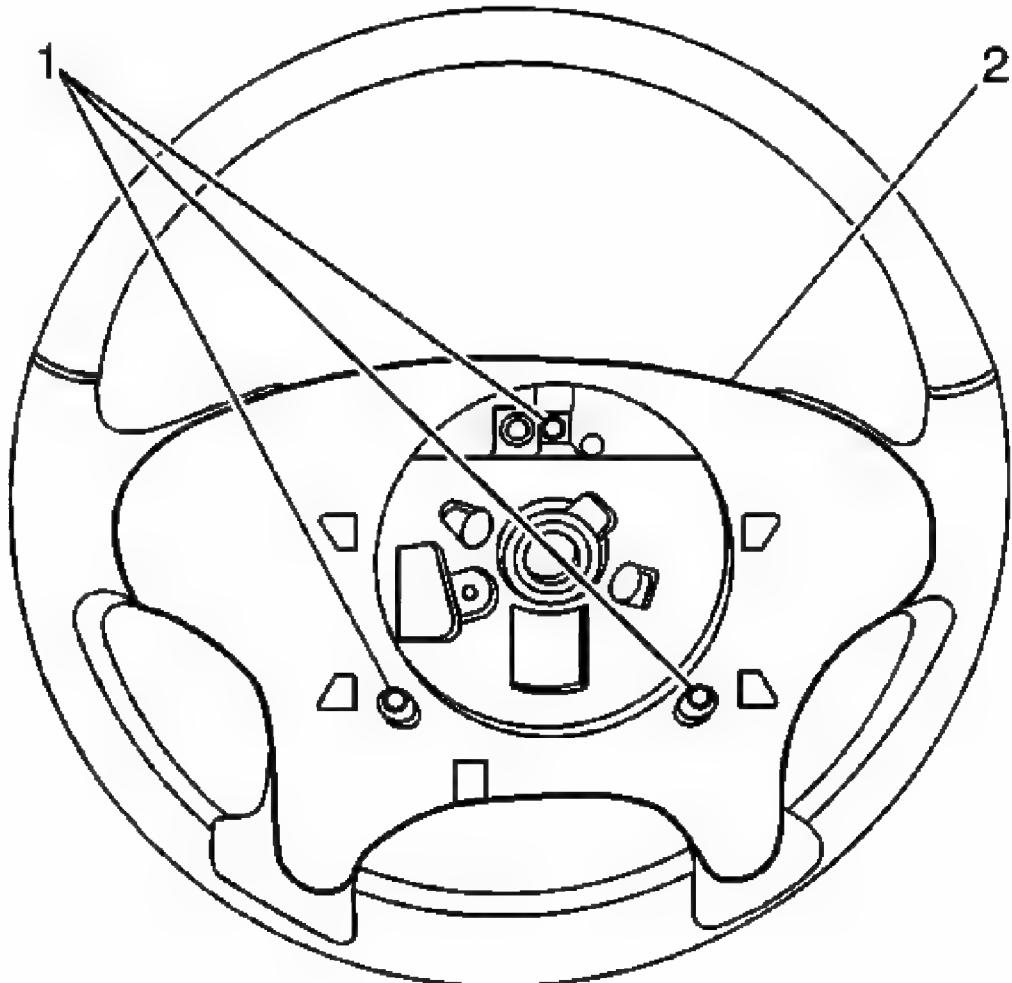


Fig. 68: View of Steering Wheel Bezel & Retaining Screws
Courtesy of GENERAL MOTORS CORP.

4. Install the steering wheel bezel (2).

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

5. Install the retaining screws (1) to the steering wheel bezel.

Tighten: Tighten screws to 3 N.m (27 lb in).

6. Install the steering wheel. Refer to Steering Wheel Replacement.

7. Enable the SIR system. Refer to SIR Disabling and Enabling in SIR.

STEERING WHEEL REPLACEMENT

Tools Required

- J 42578 Steering Wheel Puller Legs. See [Special Tools](#).
- J 1859-A Steering Wheel Puller. See [Special Tools](#).

Removal Procedure

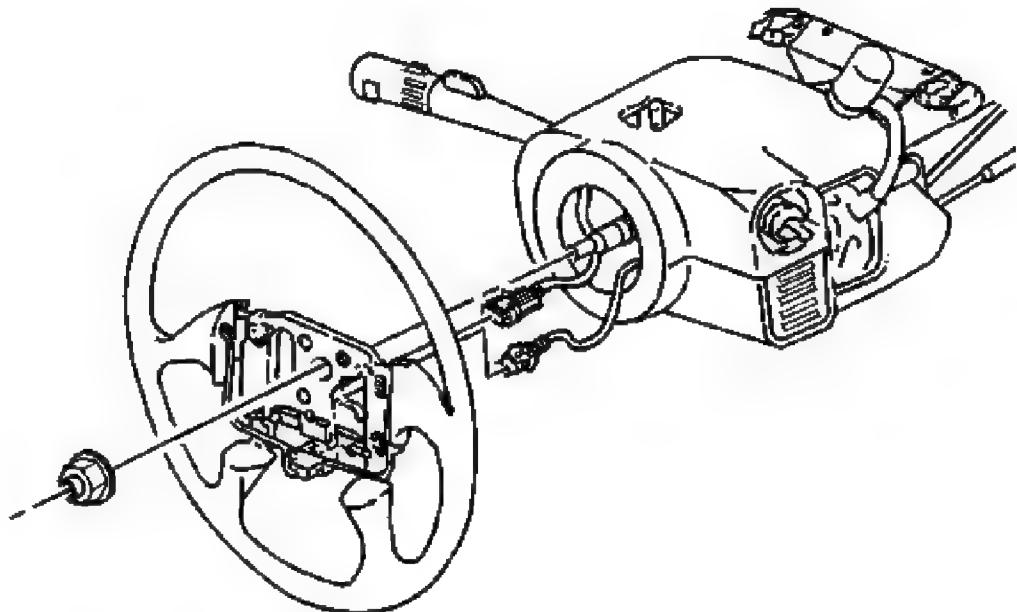


Fig. 69: Steering Wheel, Shaft & Nut

Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to [SIR Caution in Cautions and Notices](#).

1. Disable the SIR system. Refer to [SIR Disabling and Enabling](#) in SIR.
2. Remove the Inflatable restraint steering wheel module. Refer to [Inflatable Restraint Steering Wheel Module Replacement](#) in SIR.
3. Disconnect the steering wheel electrical connector.
4. Remove the weight block from the steering wheel base, if equipped.
5. Remove the steering wheel retaining nut.
6. Note the mark on the steering shaft and the steering wheel in order to ensure proper

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alignment during installation.

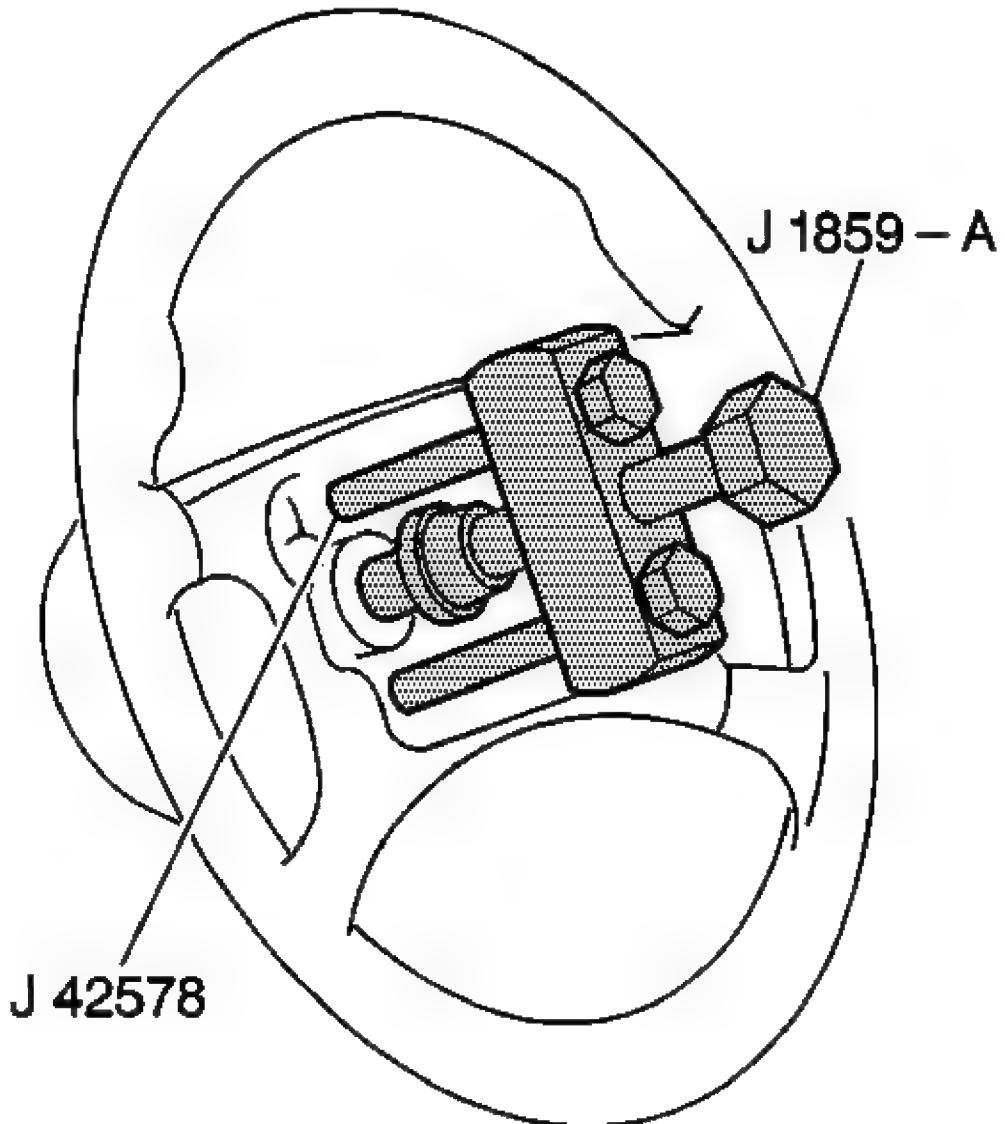


Fig. 70: Removing/Installing Steering Wheel
Courtesy of GENERAL MOTORS CORP.

7. Install **J 42578** and **J 1859-A** to the steering wheel. See [Special Tools](#).
8. Use **J 42578** and **J 1859-A** to separate the steering wheel from the steering column. See [Special Tools](#).
9. Remove the steering wheel from the steering column.

10. Remove the **J 42578** and **J 1859-A** from the steering wheel. See **Special Tools**.

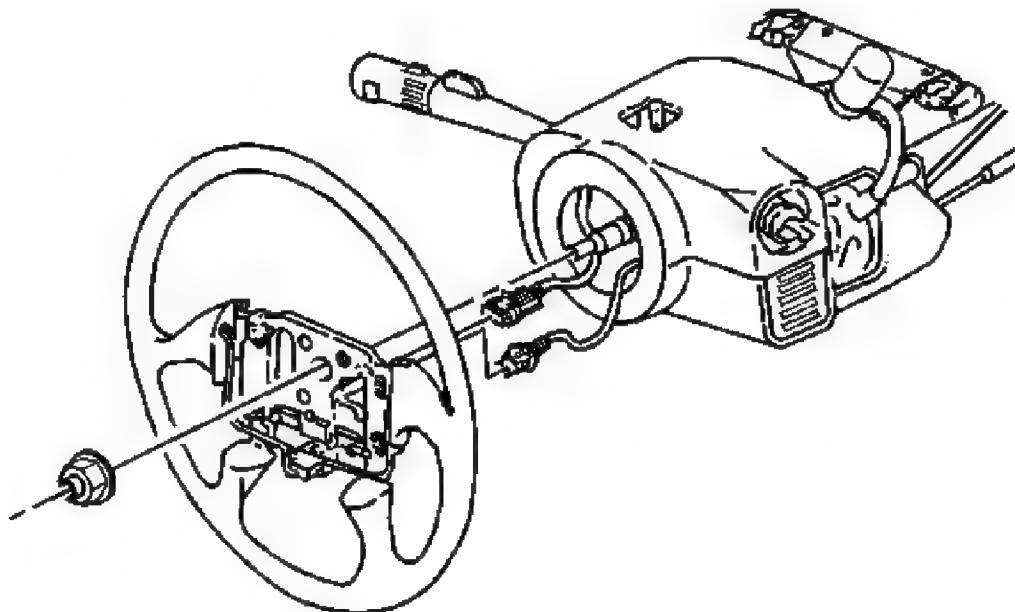
Installation Procedure

Fig. 71: Steering Wheel, Shaft & Nut
Courtesy of GENERAL MOTORS CORP.

1. Route the wiring through the steering wheel.
2. Align the mark on the steering wheel with the mark on the shaft.
3. Install the steering wheel.

NOTE: Refer to **FASTENER NOTICE** in Cautions and Notices.

4. Install the steering wheel retaining nut.

Tighten: Tighten the nut to 41 N.m (30 lb ft).

5. Install the weight block to the steering wheel if equipped.
6. Connect the steering wheel electrical connector.
7. Install the inflatable restraint steering wheel module. Refer to **Inflatable Restraint Steering Wheel Module Replacement** in SIR.
8. Enable the SIR system. Refer to **SIR Disabling and Enabling** in SIR.

TILT SPRING REPLACEMENT

Removal Procedure

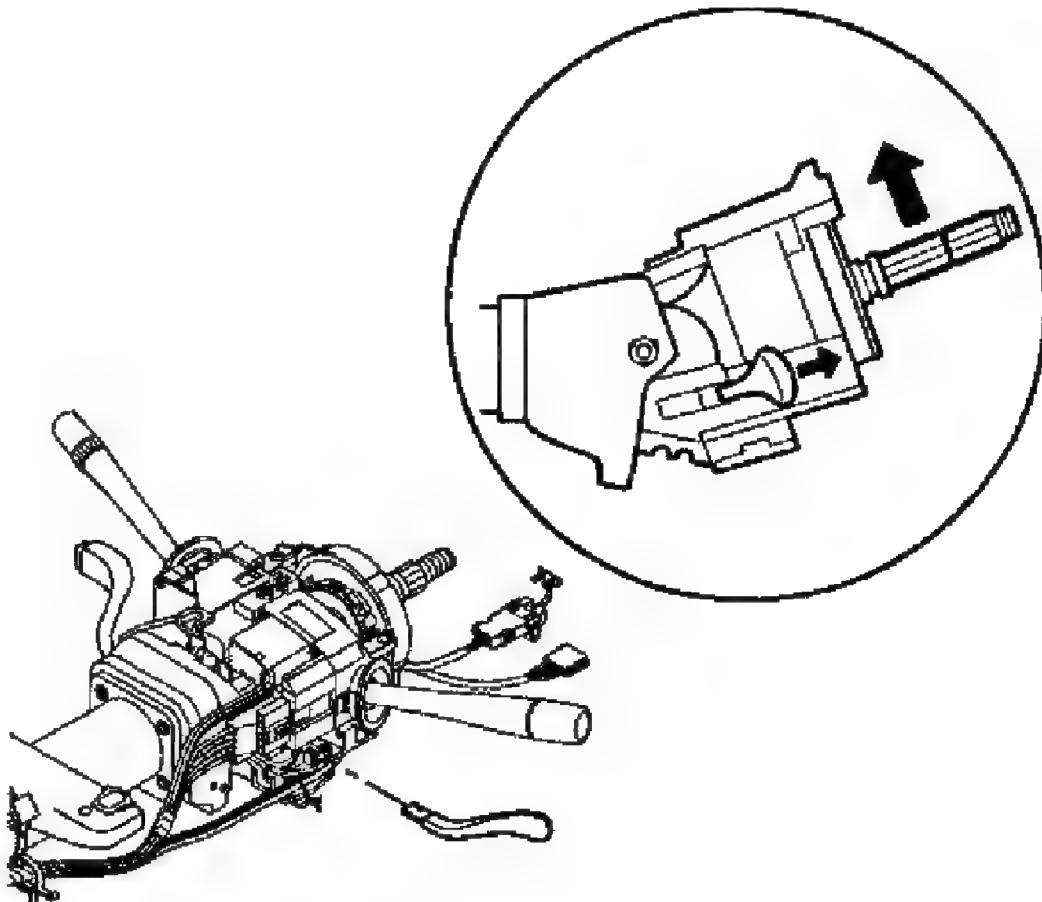


Fig. 72: Tilting Column To Up Position
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the SIR system. Refer to SIR Disabling and Enabling in SIR.
2. Remove the upper and lower trim covers. Refer to Steering Column Trim Covers Replacement.
3. Install the tilt lever onto the steering column tilt head assembly.
4. Use the tilt lever to tilt the column to the UP position.

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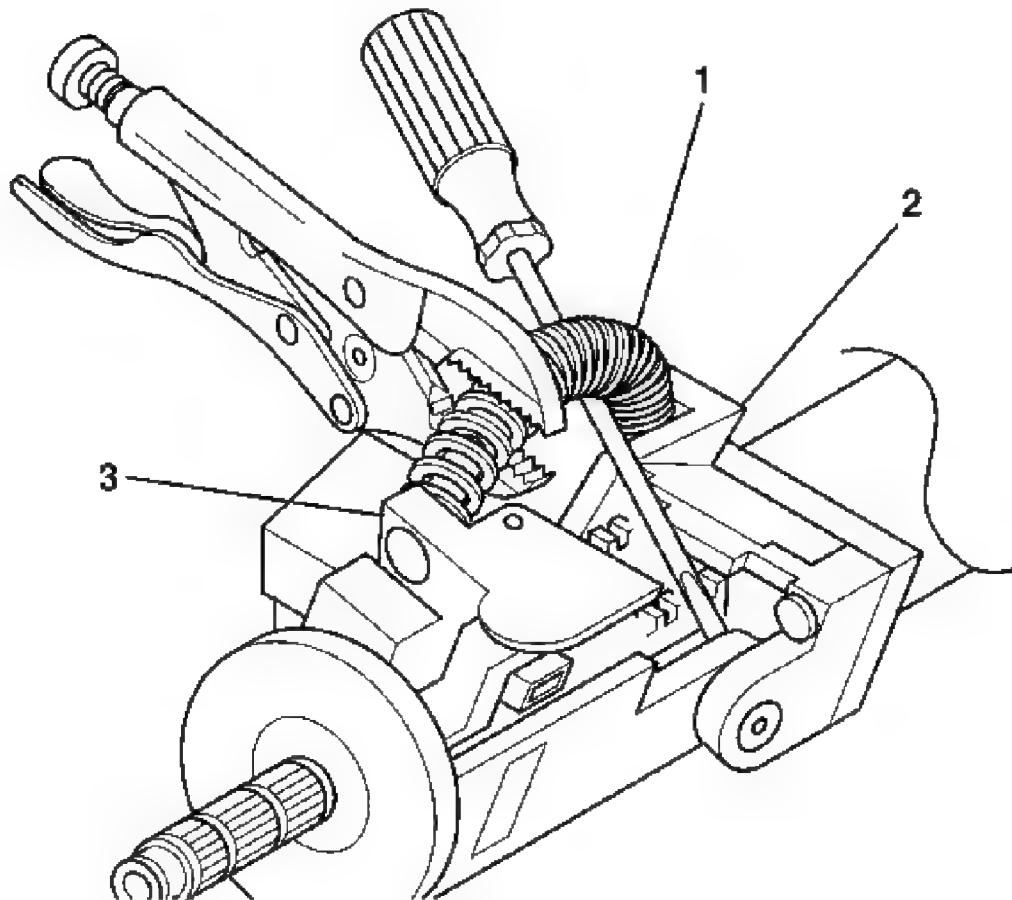


Fig. 73: Removing Tilt Spring From Steering Column Support Assembly
Courtesy of GENERAL MOTORS CORP.

CAUTION: The tilt spring and the spring guide are under pressure. The tilt spring and the spring guide may become a projectile. Secure the spring with locking pliers during removal. Secure the spring with locking pliers during installation. Bodily injury may result during removal and installation of the tilt spring and the spring guide. Always use caution during removal and installation of the tilt spring and the spring guide.

5. Remove the tilt spring (1) from the steering column support assembly (2) and from the steering column tilt head assembly (3) by using the following procedure:

1. Pry up the tilt spring (1) until a bulge occurs and most of the tilt spring tension is

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removed.

2. Secure the tilt spring (1) with locking pliers.
3. Continue prying up the tilt spring (1) until the tilt spring disengages from the post on the steering column support assembly (2) and from the steering column tilt head assembly (3).

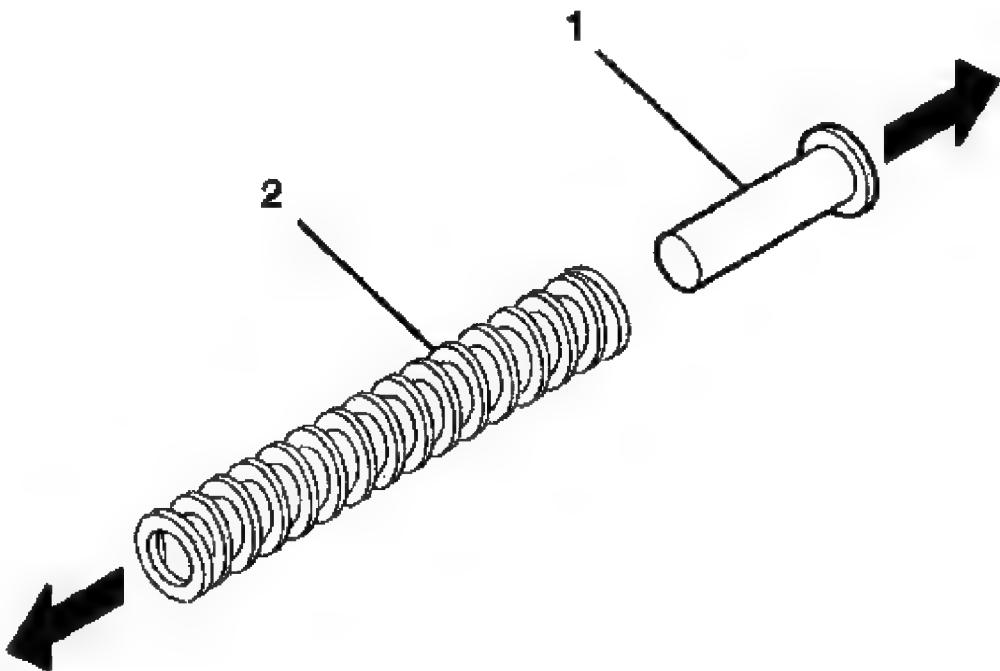


Fig. 74: Identifying Spring Guide Components

Courtesy of GENERAL MOTORS CORP.

6. Remove the spring guide (1) from the tilt spring (2).

Installation Procedure

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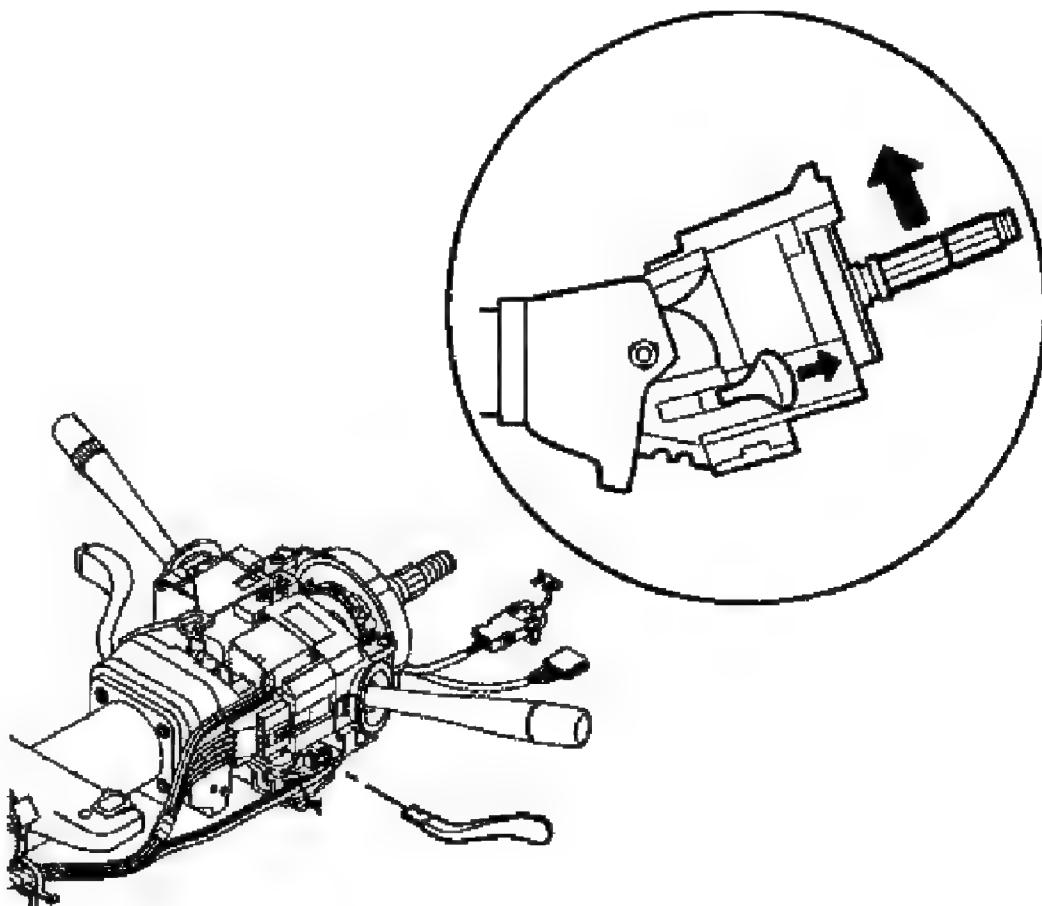


Fig. 75: Tilting Column To Up Position
Courtesy of GENERAL MOTORS CORP.

1. Use the tilt lever to tilt the column to the UP position.

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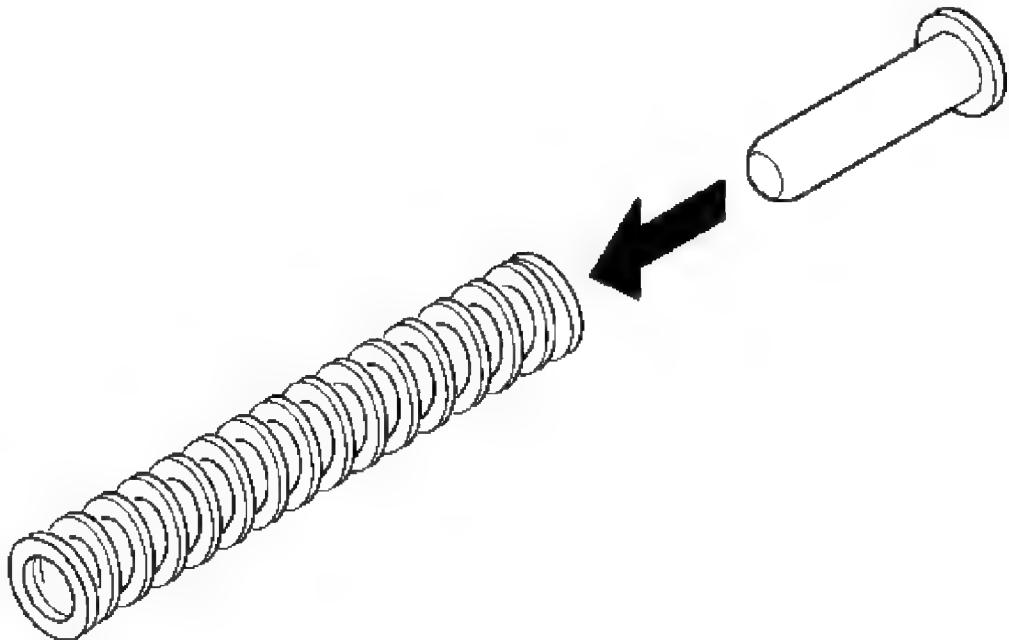


Fig. 76: Spring Guide & Tilt Spring
Courtesy of GENERAL MOTORS CORP.

2. Install the spring guide into the tilt spring.

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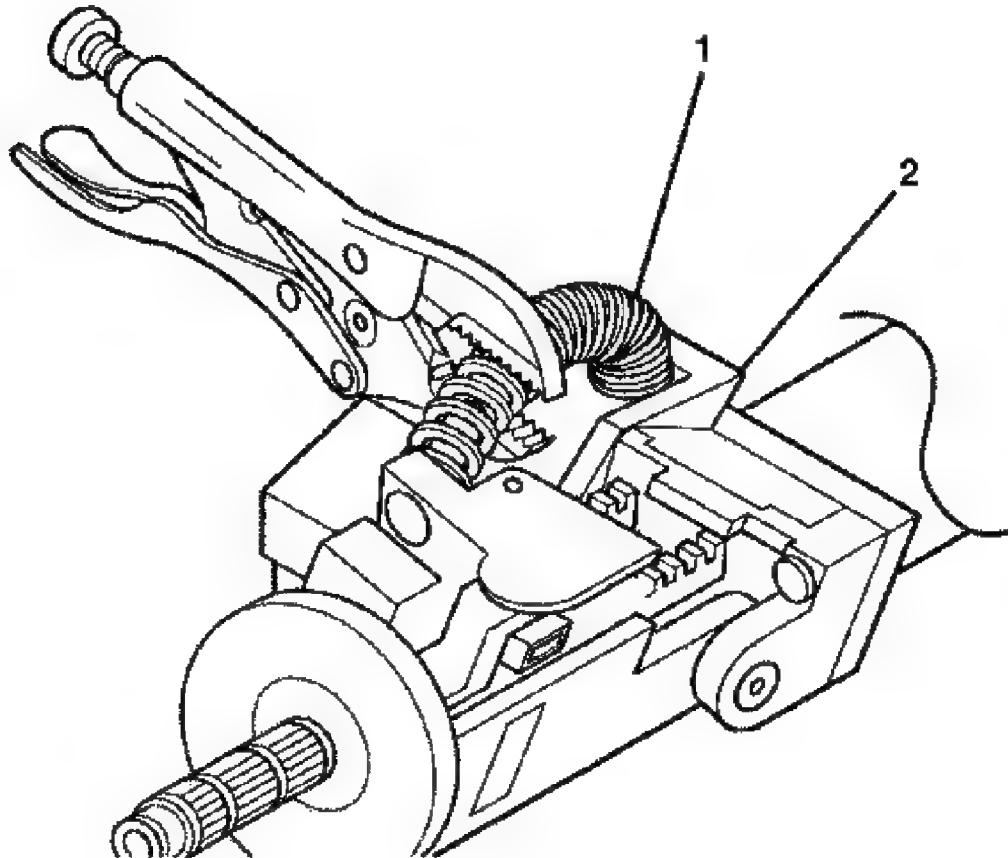


Fig. 77: Installing Tilt Spring Onto The Steering Column Support Assembly
Courtesy of GENERAL MOTORS CORP.

CAUTION: The tilt spring and the spring guide are under pressure. The tilt spring and the spring guide may become a projectile. Secure the spring with locking pliers during removal. Secure the spring with locking pliers during installation. Bodily injury may result during removal and installation of the tilt spring and the spring guide. Always use caution during removal and installation of the tilt spring and the spring guide.

3. Install the tilt spring (1) onto the steering column support assembly (2) and onto the steering column tilt head assembly by using the following procedure:
 1. Install the tilt spring (1) onto the steering column tilt head assembly.
 2. Install the tilt spring (1) onto the post on the steering column support assembly (2).

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4. Install the upper and lower trim covers. Refer to [**Steering Column Trim Covers Replacement**](#).
5. Enable the SIR system. Refer to [**SIR Disabling and Enabling**](#) in SIR.

STEERING COLUMN TILT HEAD HOUSING REPLACEMENT

Tools Required

- **J 23653-SIR** Steering Column Lock Plate Compressor
- **J 42137** Steering Column Lock Plate Compressor Adapter. See [**Special Tools**](#).

Removal Procedure

CAUTION: Refer to [SIR Caution in Cautions and Notices**](#).**

1. Disable the SIR system. Refer to [**SIR Disabling and Enabling**](#) in SIR.
2. Remove the SIR coil. Refer to [**Inflatable Restraint Steering Wheel Module Coil Replacement**](#) in SIR.

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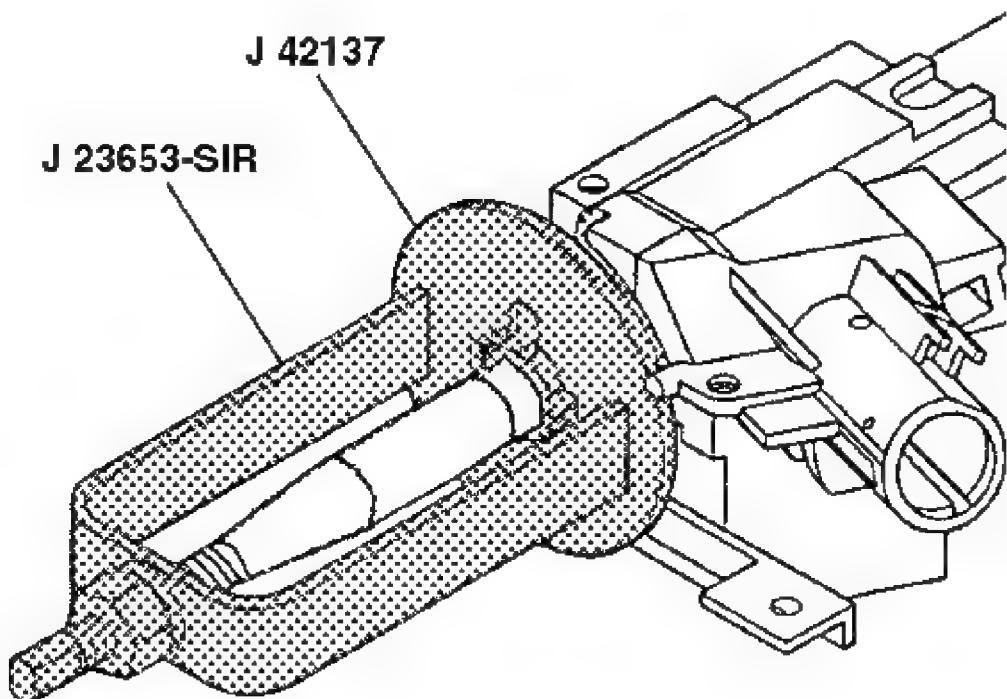


Fig. 78: Compressing Cam Orientation Plate Using J 23653-SIR & J 42137
Courtesy of GENERAL MOTORS CORP.

3. Remove the bearing retainer using **J 23653-SIR** and **J 42137** and dispose of it. See **Special Tools**.
4. Remove **J 23653-SIR** and **J 42137** from the steering shaft assembly. See **Special Tools**.

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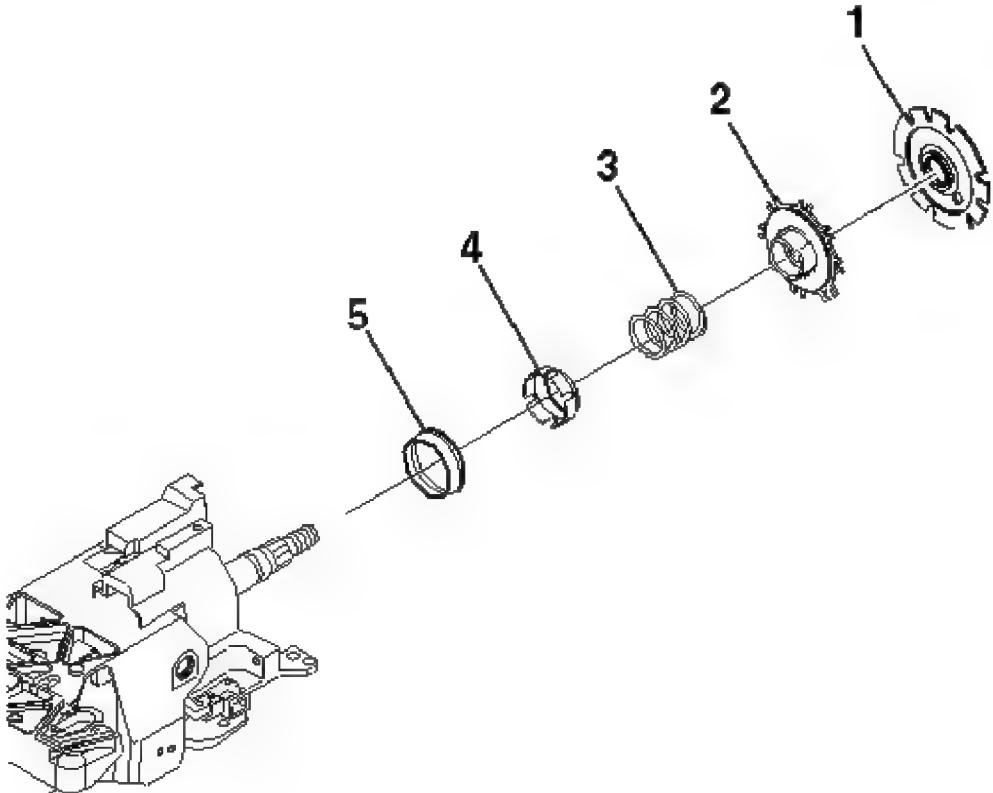


Fig. 79: View of Shaft Lock Shield Assembly, Turn Signal Cancel Cam Assembly, Upper Bearing Spring, Bearing Inner Race Seat & Inner Race

Courtesy of GENERAL MOTORS CORP.

5. Remove the shaft lock shield assembly (1).
6. Remove the turn signal cancel cam assembly (2).
7. Remove the upper bearing spring (3).
8. Remove the upper bearing inner race seat (4).
9. Remove the inner race (5).

Installation Procedure

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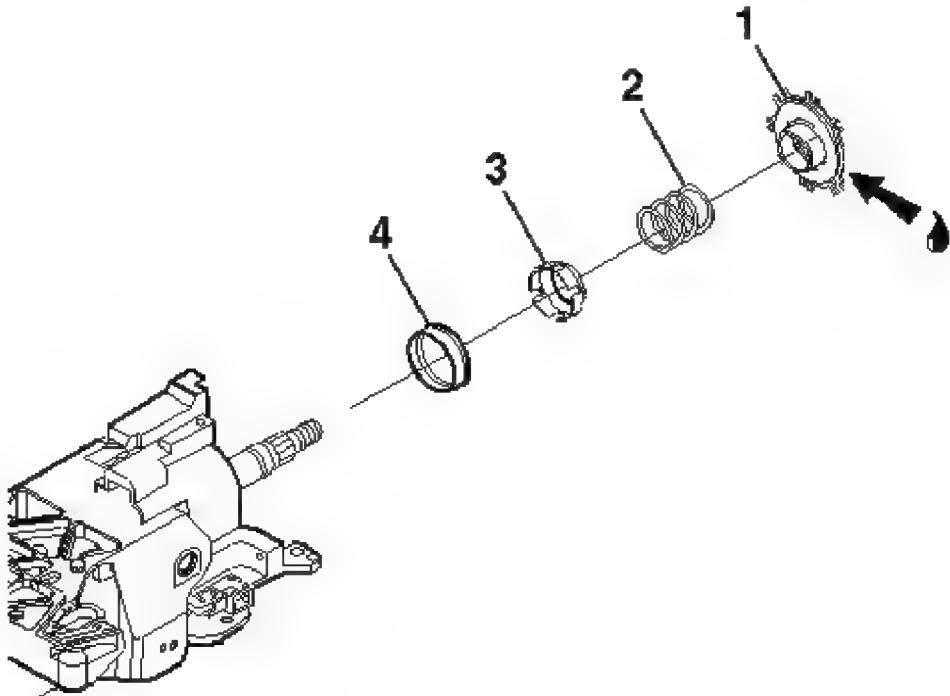


Fig. 80: View of Inner Race, Upper Bearing Inner Race Seat, Upper Bearing Spring & Turn Signal Cancel Cam Assembly
Courtesy of GENERAL MOTORS CORP.

1. Install the inner race (4).
2. Install the upper bearing inner race seat (3).
3. Install the upper bearing spring (2).
4. Lubricate the turn signal cancel cam assembly (1) with GM P/N 12377900 (Canadian P/N 10953529).
5. Install the turn signal cancel cam assembly (1).

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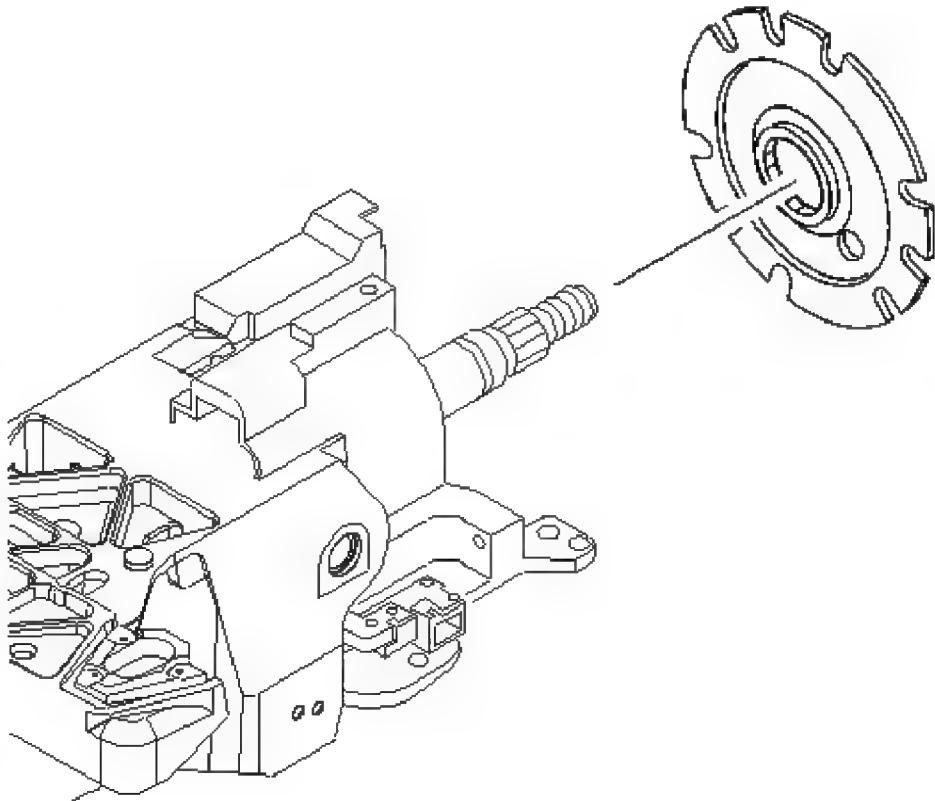


Fig. 81: View of Shaft Lock Shield Assembly

Courtesy of GENERAL MOTORS CORP.

6. Install the shaft lock shield assembly.

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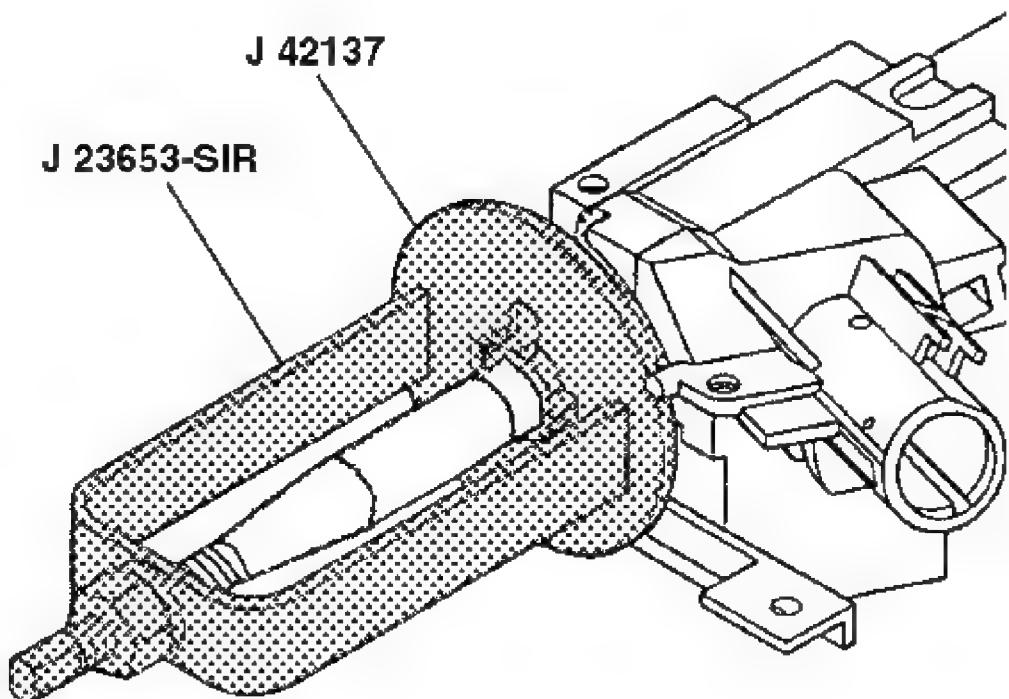


Fig. 82: Compressing Cam Orientation Plate Using J 23653-SIR & J 42137
Courtesy of GENERAL MOTORS CORP.

7. Install the new bearing retainer using **J 23653-SIR** and **J 42137**. See Special Tools.
8. Remove **J 23653-SIR** and **J 42137** from the steering shaft assembly. See Special Tools.
9. Install the SIR coil. Refer to Inflatable Restraint Steering Wheel Module Coil Replacement in SIR.
10. Enable the SIR system. Refer to SIR Disabling and Enabling in SIR.

TURN SIGNAL CANCEL CAM AND UPPER BEARING INNER RACE REPLACEMENT

Tools Required

- **J 23653-SIR** Steering Column Lock Plate Compressor. See Special Tools.
- **J 42137** Steering Column Lock Plate Compressor Adapter. See Special Tools.

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Removal Procedure

CAUTION: Refer to SIR Caution .

**IMPORTANT: Do not remove the upper shroud from the closeout trim cover
Do not remove the closeout trim cover from the Instrument Panel.**

1. Disable the SIR system. Refer to **SIR Disabling and Enabling**.

Remove the steering wheel from the steering column. Refer to **Steering Wheel Replacement**.

2. Tilt the steering column to the CENTER position.
3. Remove the tilt lever. Refer to **Tilt Lever Replacement**.
4. Gently pry the steering column closeout trim cover from the lower trim cover (2).

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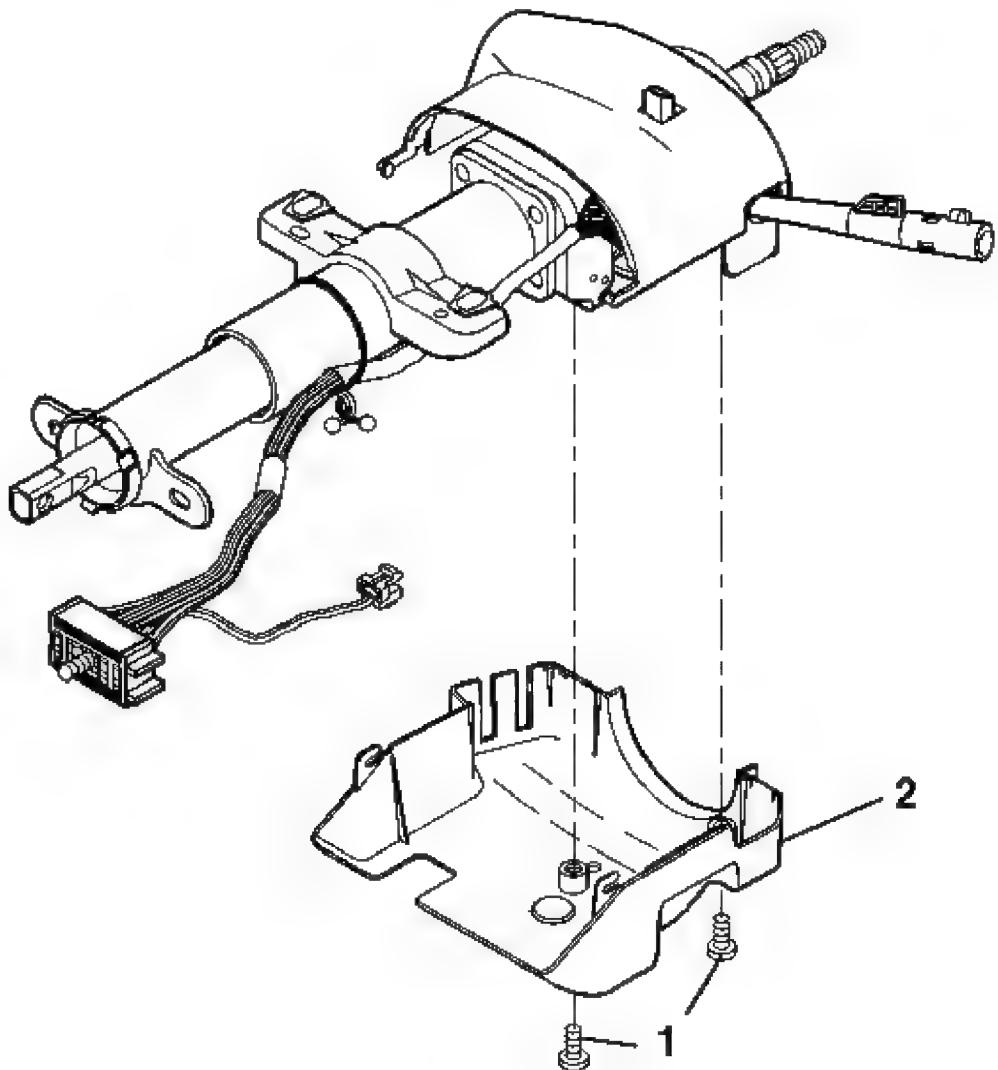


Fig. 83: Removing/Installing Lower Trim Cover
Courtesy of GENERAL MOTORS CORP.

5. Remove the 2 pan head tapping screws (1) from the lower trim cover (2).
6. Remove the lower trim cover (2).

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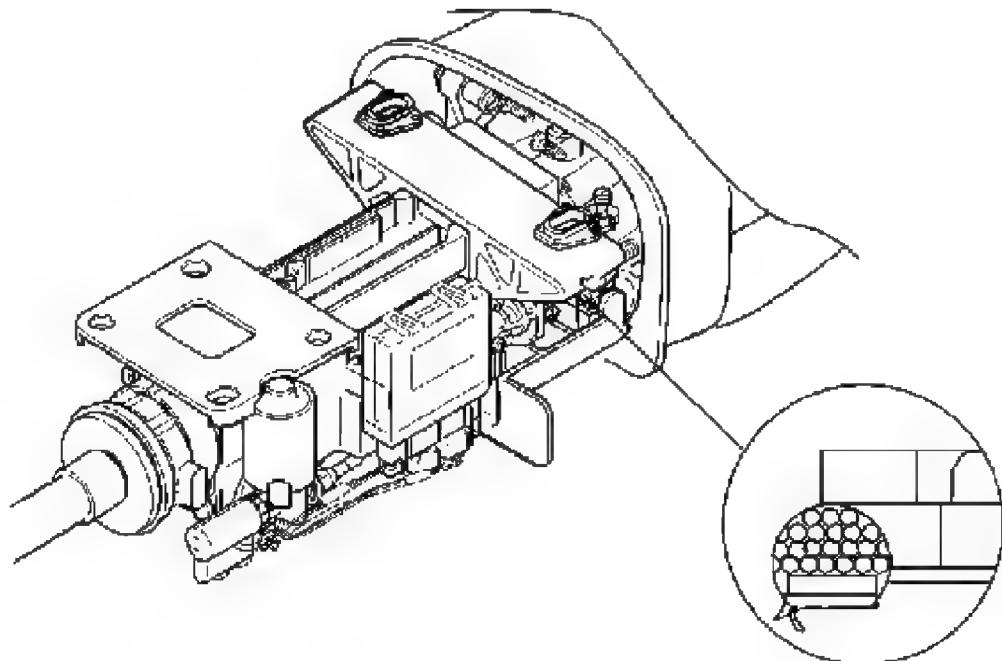


Fig. 84: Removing/Installing Plastic Mounted Steering Column Bracket
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If the steering wheel has PAD control, the inflatable restraint steering wheel module coil and wire harness assembly must come off as one piece.
If the steering wheel does not have PAD control, the inflatable restraint steering wheel module coil will come off by itself.

7. Remove the wire harness strap.
8. If the steering wheel has PAD control remove the wire harness assembly. Refer to **Steering Column Wiring Harness Replacement**.

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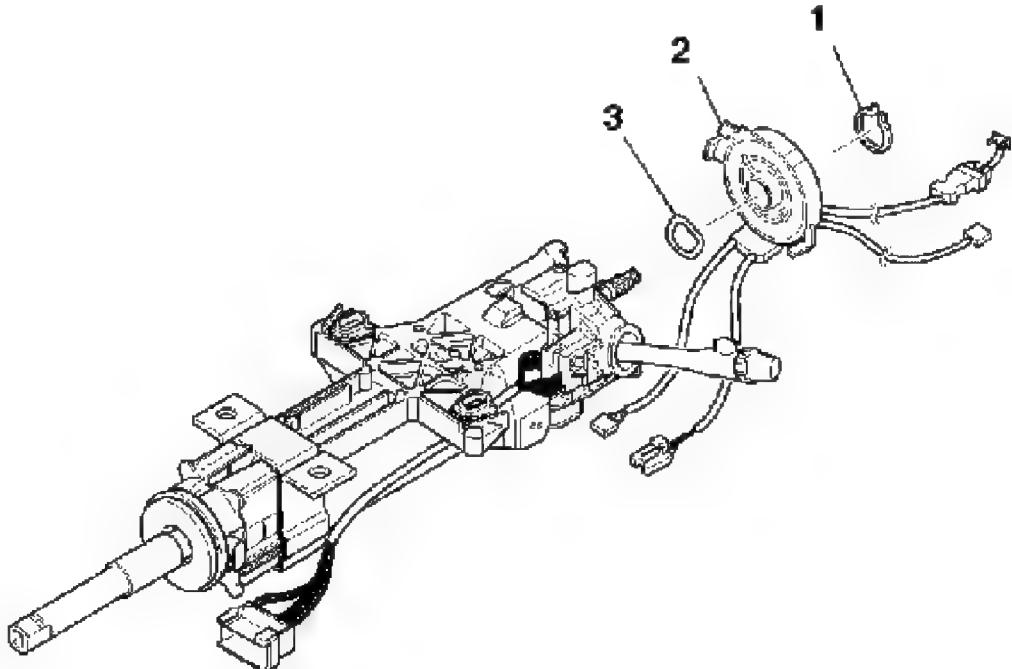


Fig. 85: Removing/Installing Steering Wheel Module Coil

Courtesy of GENERAL MOTORS CORP.

9. Remove the retaining ring (1) using snap ring pliers.
10. Remove the inflatable restraint steering wheel module coil (2).
11. Remove the wave washer (3).

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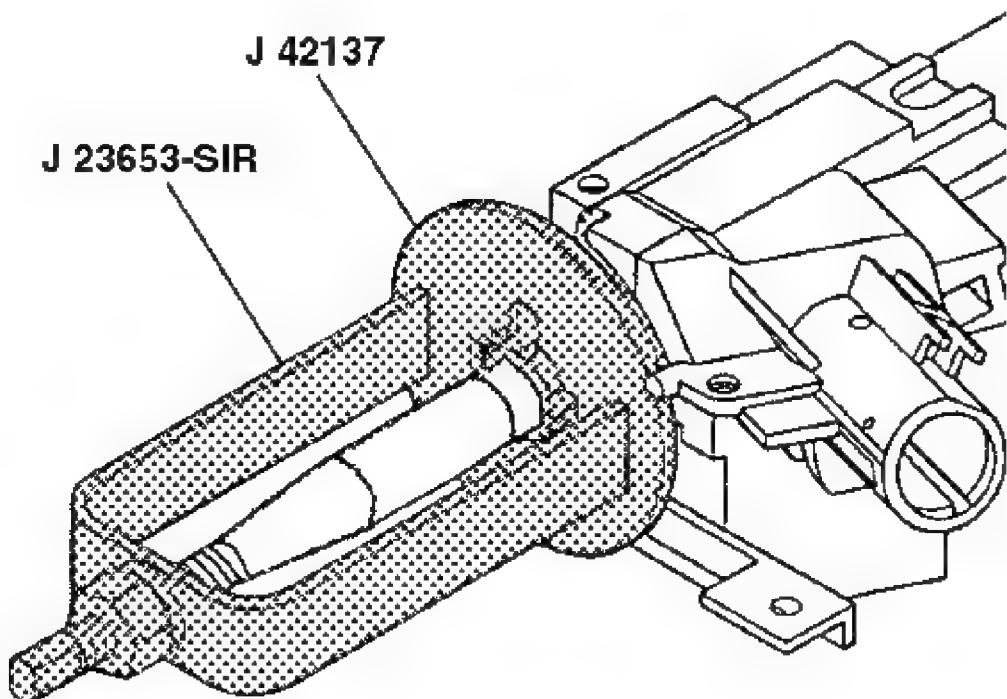


Fig. 86: Compressing Cam Orientation Plate Using J 23653-SIR & J 42137
Courtesy of GENERAL MOTORS CORP.

12. Compress the cam orientation plate using **J 23653-SIR** and **J 42137**. See Special Tools.
13. Remove the bearing retainer from the steering shaft assembly.
14. Remove **J 23653-SIR** and **J 42137**. See Special Tools.
15. Dispose of the bearing retainer.

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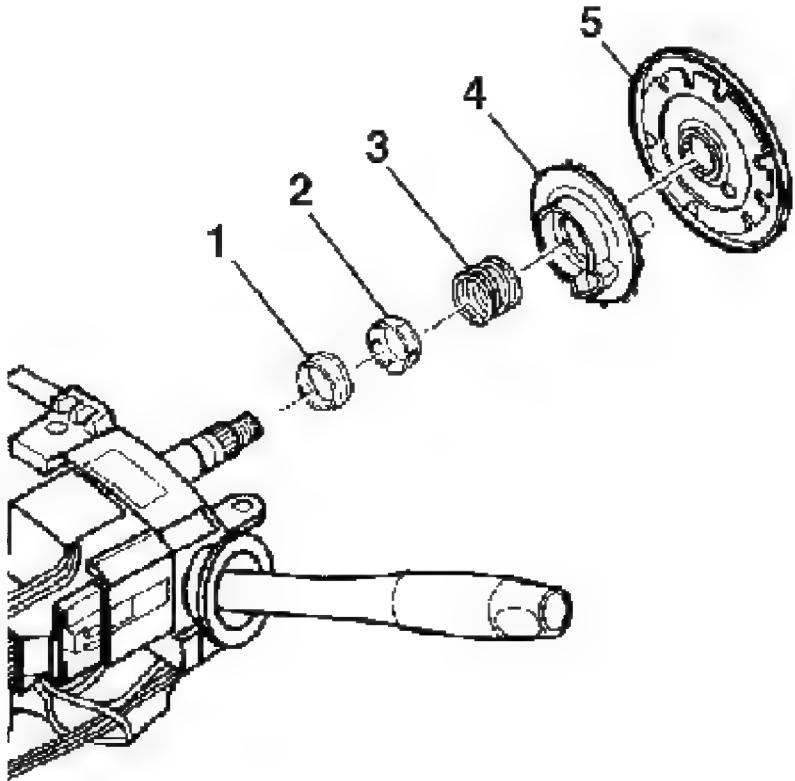


Fig. 87: Removing Turn Signal Cancel Cam & Inner Race
Courtesy of GENERAL MOTORS CORP.

16. Remove the following from the steering shaft:
 1. Shaft lock shield (5)
 2. Turn signal cancel cam assembly (4)
 3. Upper bearing spring (3)
 4. Upper bearing inner race seat (2)
 5. Inner race (1)

Installation Procedure

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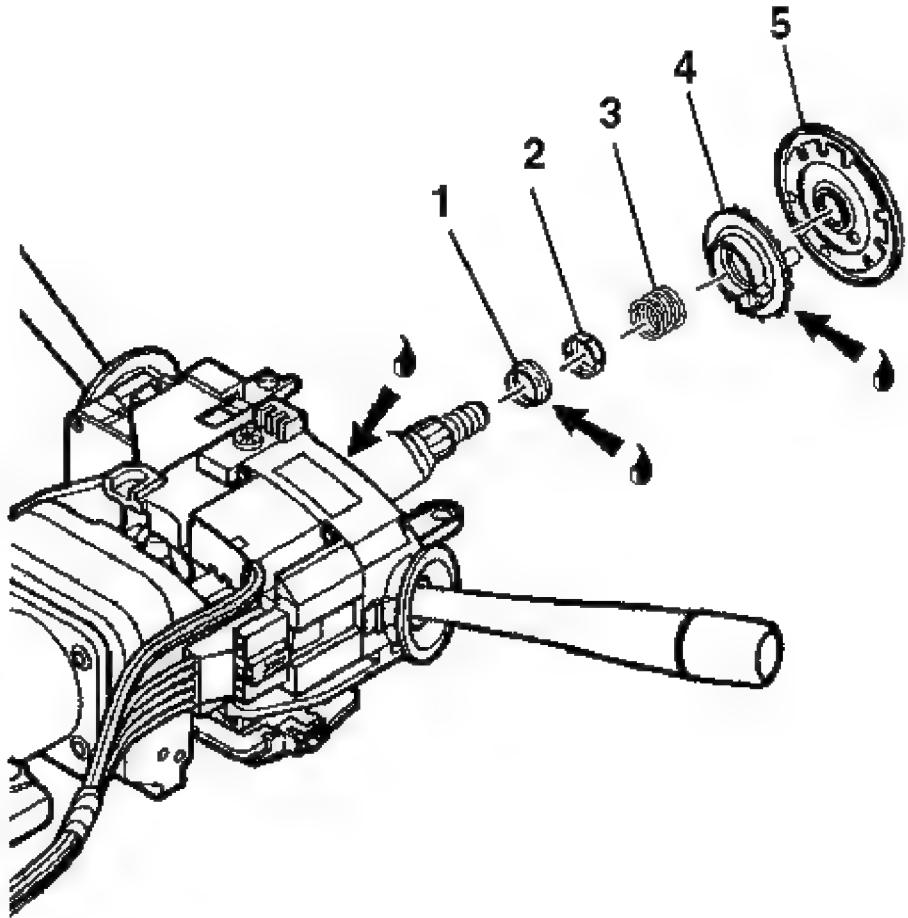


Fig. 88: Installing Turn Signal Cancel Cam & Inner Race
Courtesy of GENERAL MOTORS CORP.

1. Install the following to the steering shaft:
 1. Inner race (1)
 2. Upper bearing inner race seat (2)
 3. Upper bearing spring (3)
 4. Turn signal cancel cam assembly (4)
 5. Shaft lock shield (5)

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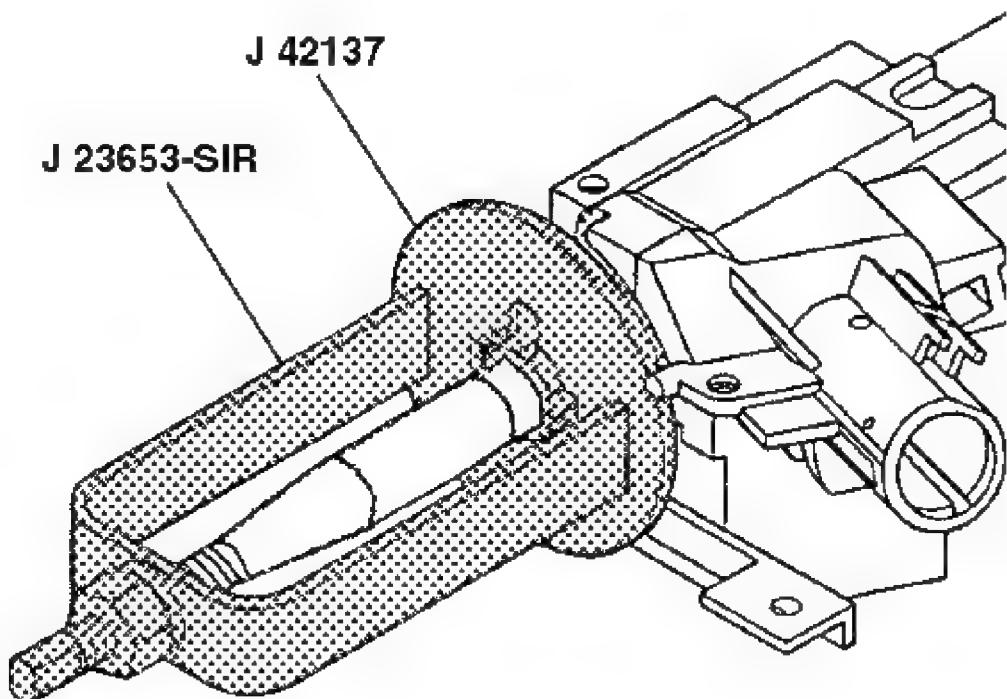


Fig. 89: Compressing Cam Orientation Plate Using J 23653-SIR & J 42137
Courtesy of GENERAL MOTORS CORP.

2. Install a new bearing retainer onto the steering shaft assembly.
3. Compress the cam orientation plate using **J 23653-SIR** and **J 42137** to install the bearing retainer. See Special Tools.
4. Remove **J 23653-SIR** and **J 42137** from the steering shaft assembly. See Special Tools.

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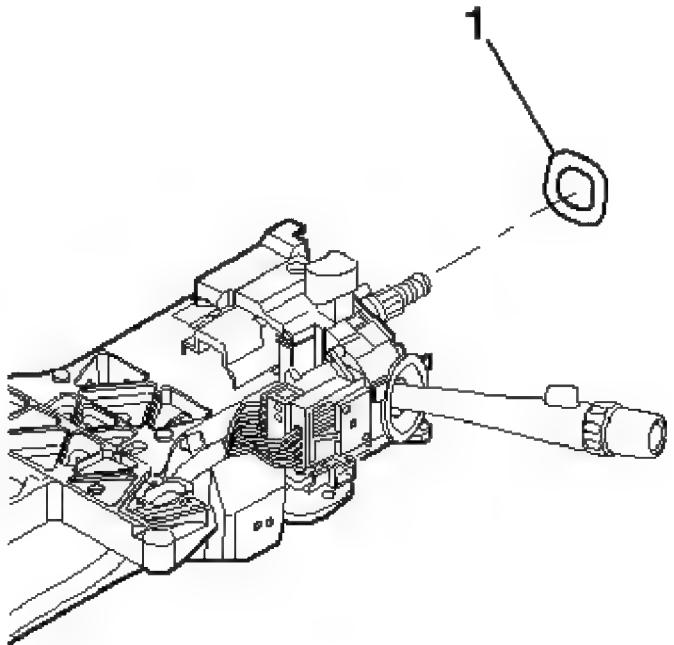


Fig. 90: Installing Wave Washer
Courtesy of GENERAL MOTORS CORP.

5. Install the wave washer (1).

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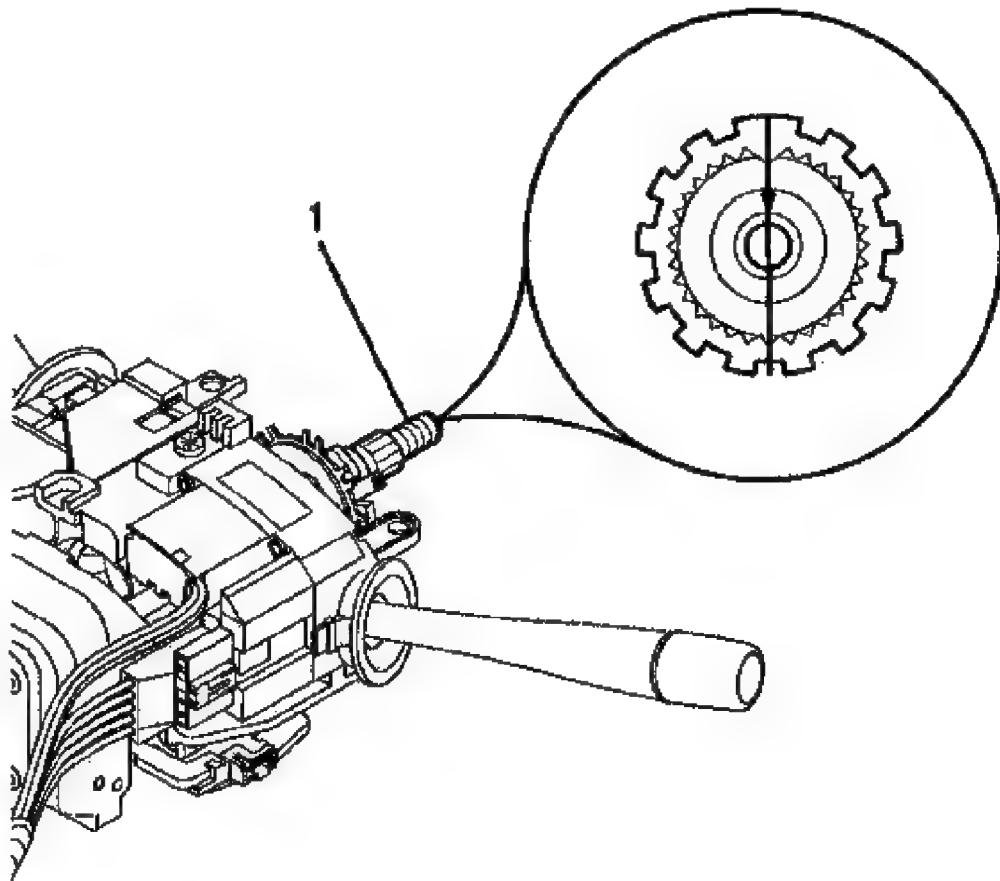


Fig. 91: View Of Block Tooth Of Steering Shaft Assembly In 12 O'clock Position
Courtesy of GENERAL MOTORS CORP.

6. Align the block tooth on the steering shaft assembly (1) to the 12 o'clock position.

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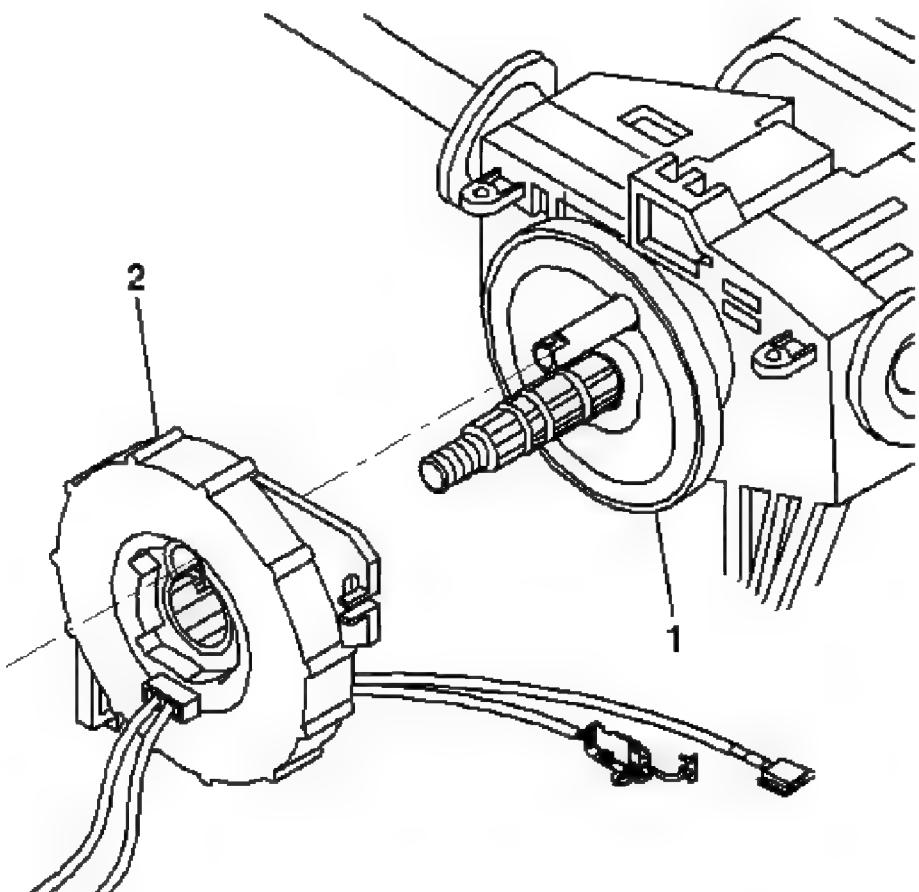


Fig. 92: Installing Inflatable Restraint Steering Wheel Module Coil
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: A new inflatable restraint steering wheel module coil is pre-centered. Do not remove the centering tab from the new inflatable restraint steering wheel module coil until installation is complete.

7. If installing the existing inflatable restraint steering wheel module coil, it must be centered first. Refer to **Inflatable Restraint Steering Wheel Module Coil Centering**.
8. Align the inflatable restraint steering wheel module coil (2) with the horn tower sticking through the shaft lock or cam orientation plate (1).
9. Slide the inflatable restraint steering wheel module coil (2) onto the steering shaft assembly.

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10. Remove and discard the centering tab from the new inflatable restraint steering wheel module coil.

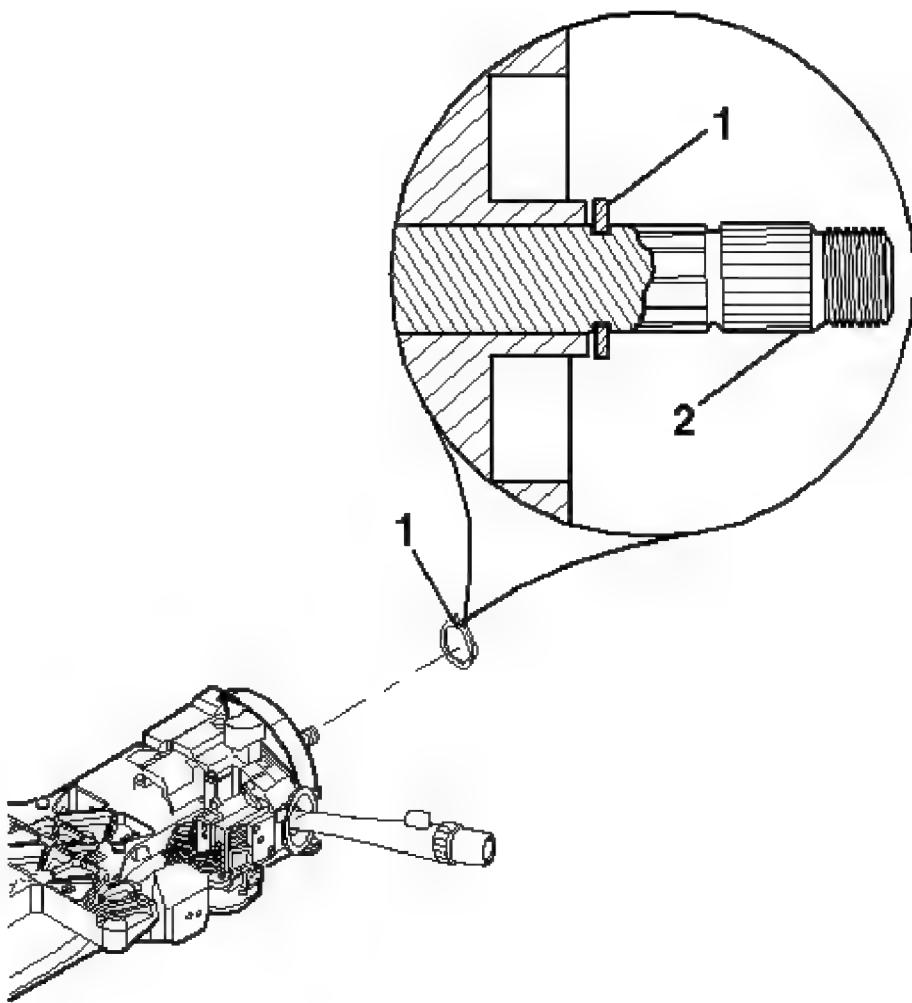


Fig. 93: Installing Retaining Ring
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The retaining ring (1) must seat securely on the groove of the race and upper shaft assembly (2).

11. Install the retaining ring (1) using snap ring pliers.

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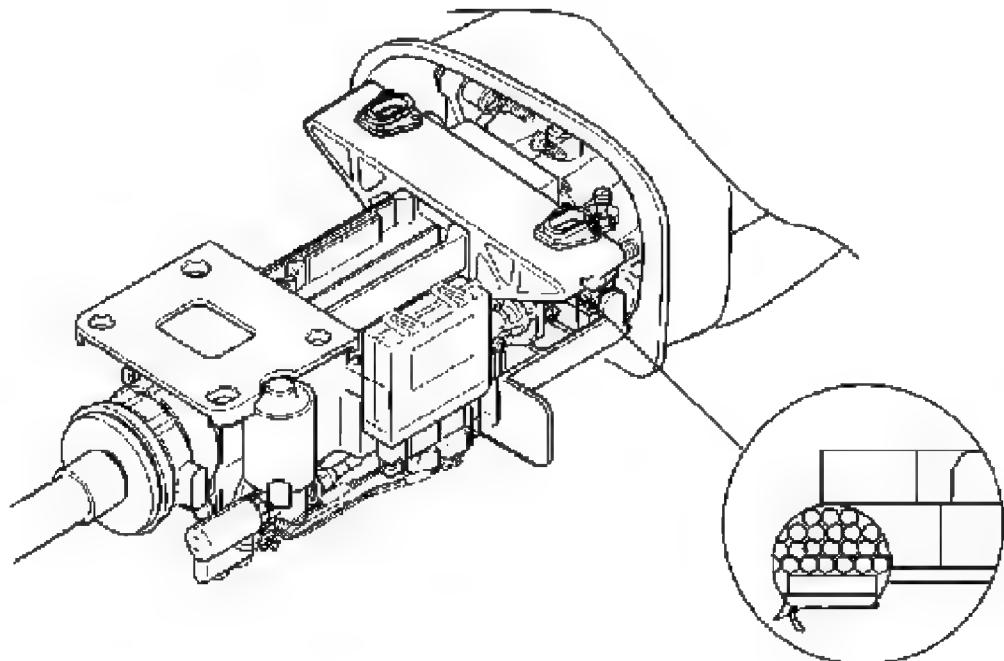


Fig. 94: Removing/Installing Plastic Mounted Steering Column Bracket
Courtesy of GENERAL MOTORS CORP.

NOTE: Improper routing of the wire harness assembly may damage the inflatable restraint steering wheel module coil. This may result in malfunction of the inflatable restraint steering wheel module coil.

12. If the steering wheel has PAD control, install the wire harness assembly. Refer to [Steering Column Wiring Harness Replacement](#).
13. Install the wire harness strap.

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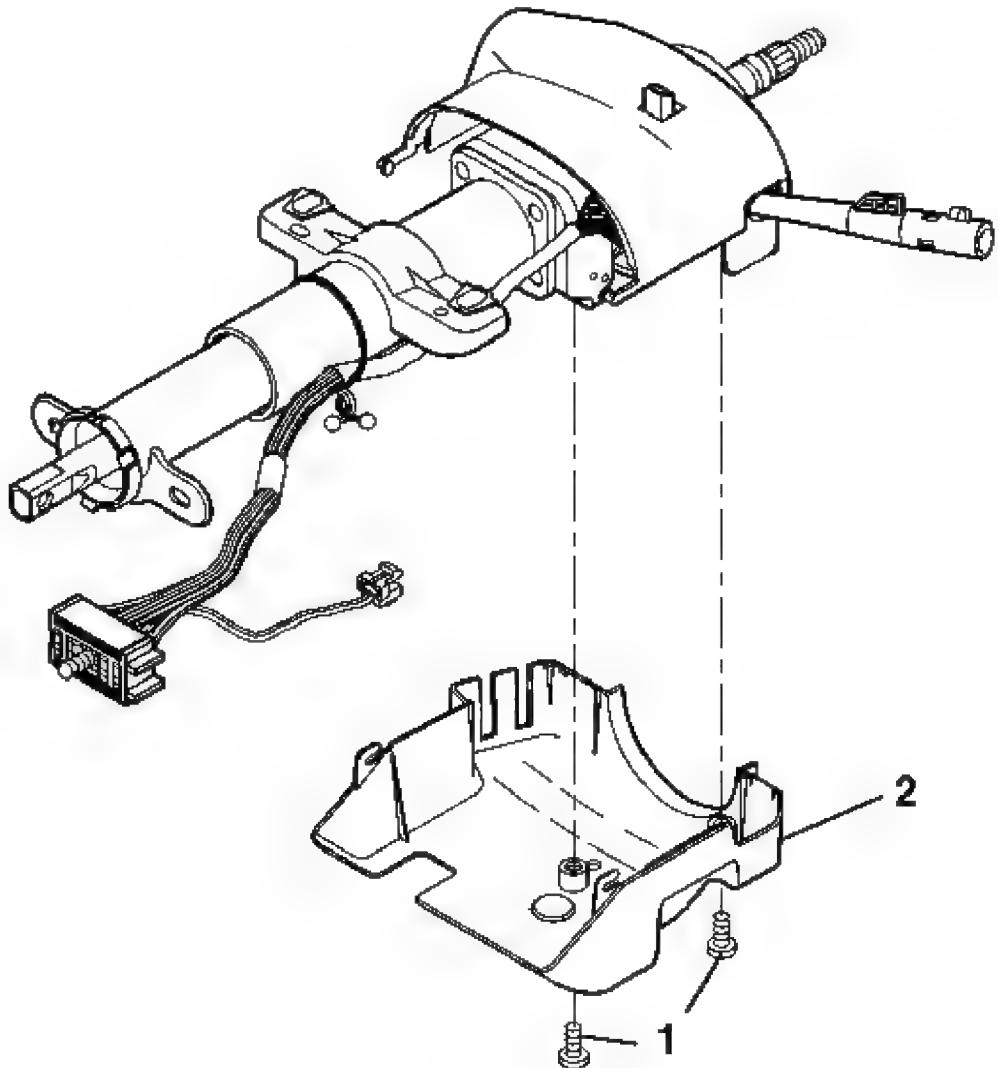


Fig. 95: Removing/Installing Lower Trim Cover
Courtesy of GENERAL MOTORS CORP.

14. Install the lower trim cover (2) onto the steering column.

NOTE: Refer to Fastener Notice.

15. Install the 2 pan head tapping screws (1) to the lower trim cover (2).

Tighten: Tighten the screws to 3 N.m (27 lb in).

16. Attach the closeout trim cover to the lower trim cover (2).

CAUTION: Refer to SIR Inflator Module Coil Caution .

17. Install the steering wheel onto the steering column. Refer to Steering Wheel Replacement.

18. Install the tilt lever. Refer to Tilt Lever Replacement

19. Enable the SIR system. Refer to SIR Disabling and Enabling .

STEERING COLUMN REPLACEMENT

Tools Required

- **J 42640** Steering Column Lock Pin
- **J 41352** Modular Column Holding Fixture. See Special Tools.

Removal Procedure

CAUTION: Refer to SIR Caution .

NOTE: The wheels of the vehicle must be straight ahead and the steering column in the LOCK position before disconnecting the steering column or intermediate shaft from the steering gear. Failure to do so will cause the SIR coil assembly to become uncentered, which may cause damage to the coil assembly.

NOTE: Once the steering column is removed from the car, the column is extremely susceptible to damage. Dropping the column on its end could collapse the steering shaft or loosen the plastic injections which maintain column rigidity. Leaning on the column could cause the jacket to bend or deform. Any of the above damage could impair the column's collapsible design. If it is necessary to remove the steering wheel, use only the specified steering wheel puller. Under no conditions should the end of the shaft be hammered upon as hammering could loosen plastic injections which maintain column rigidity.

1. Disable the SIR system. Refer to SIR Identification Views .

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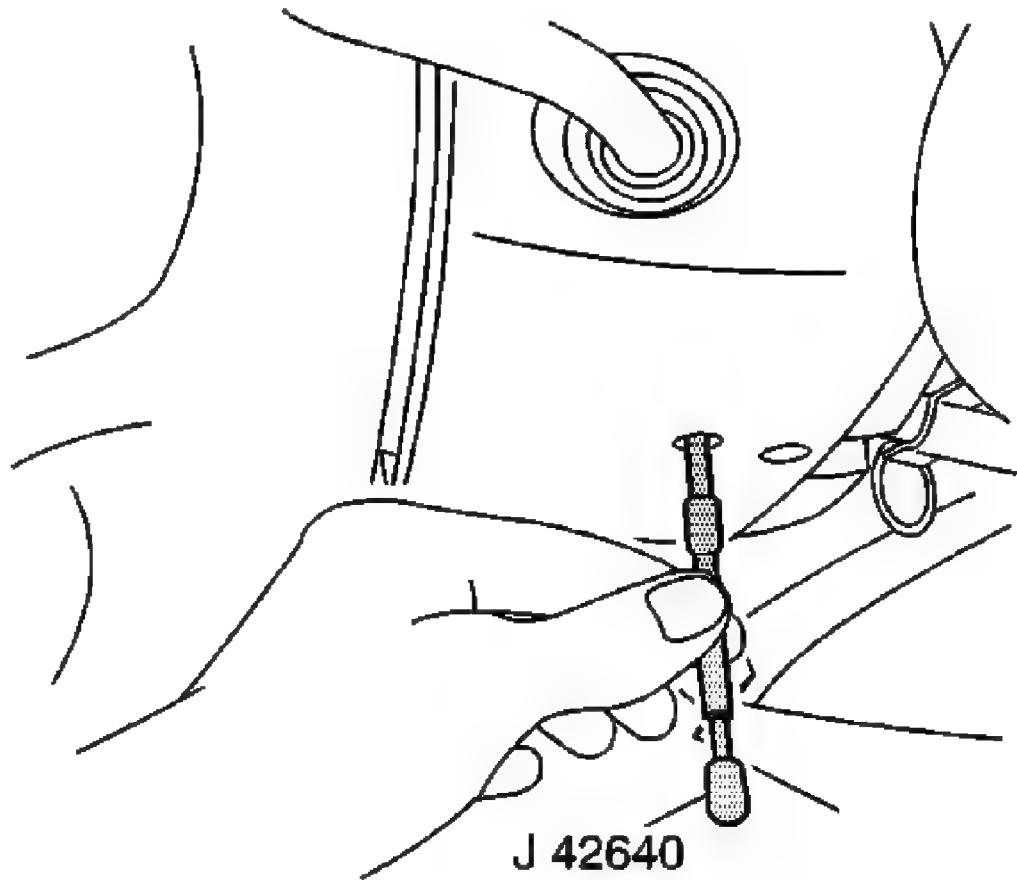


Fig. 96: Identifying J 42640

Courtesy of GENERAL MOTORS CORP.

2. Insert **J 42640** into the steering column access hole to lock the steering column. This will maintain the correct orientation.
3. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .

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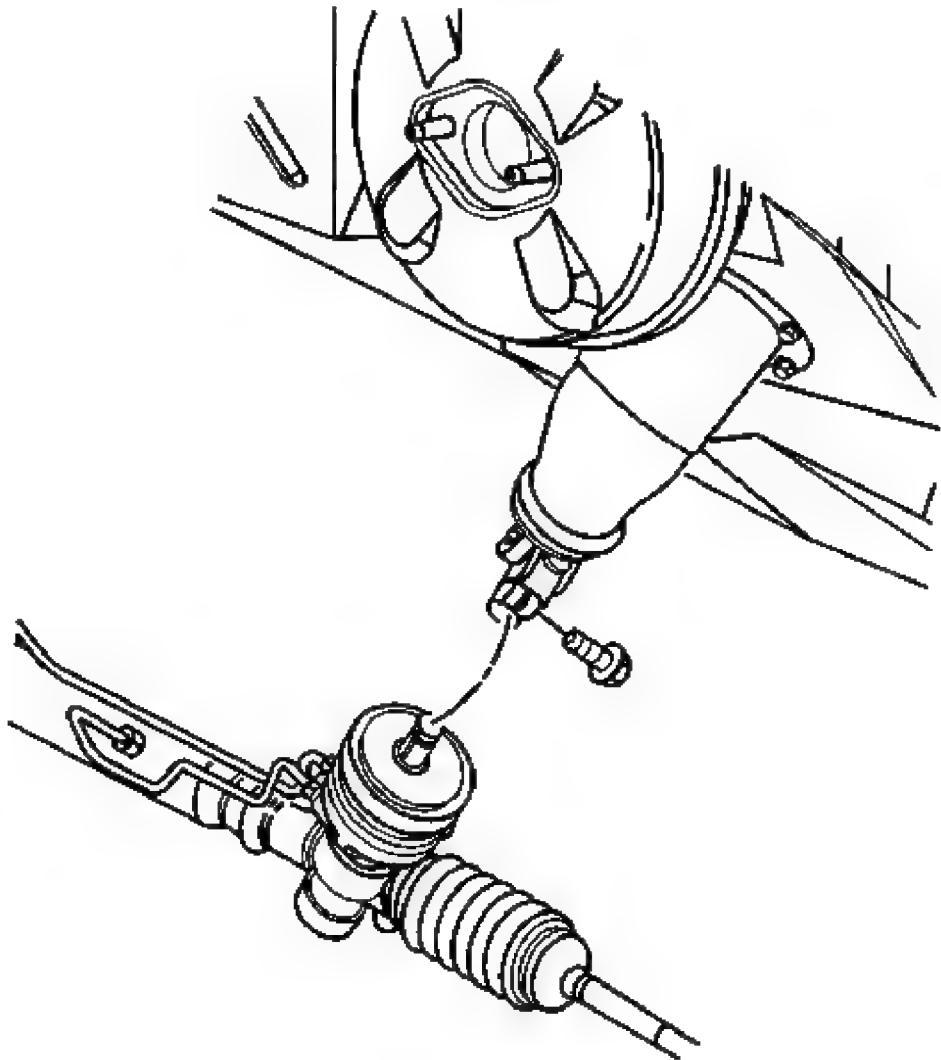


Fig. 97: Locating Steering Rack-To-Intermediate Shaft Pinch Bolt
Courtesy of GENERAL MOTORS CORP.

4. Remove the intermediate shaft lower pinch bolt.
5. Remove the intermediate shaft from the steering gear.
6. Lower the vehicle.

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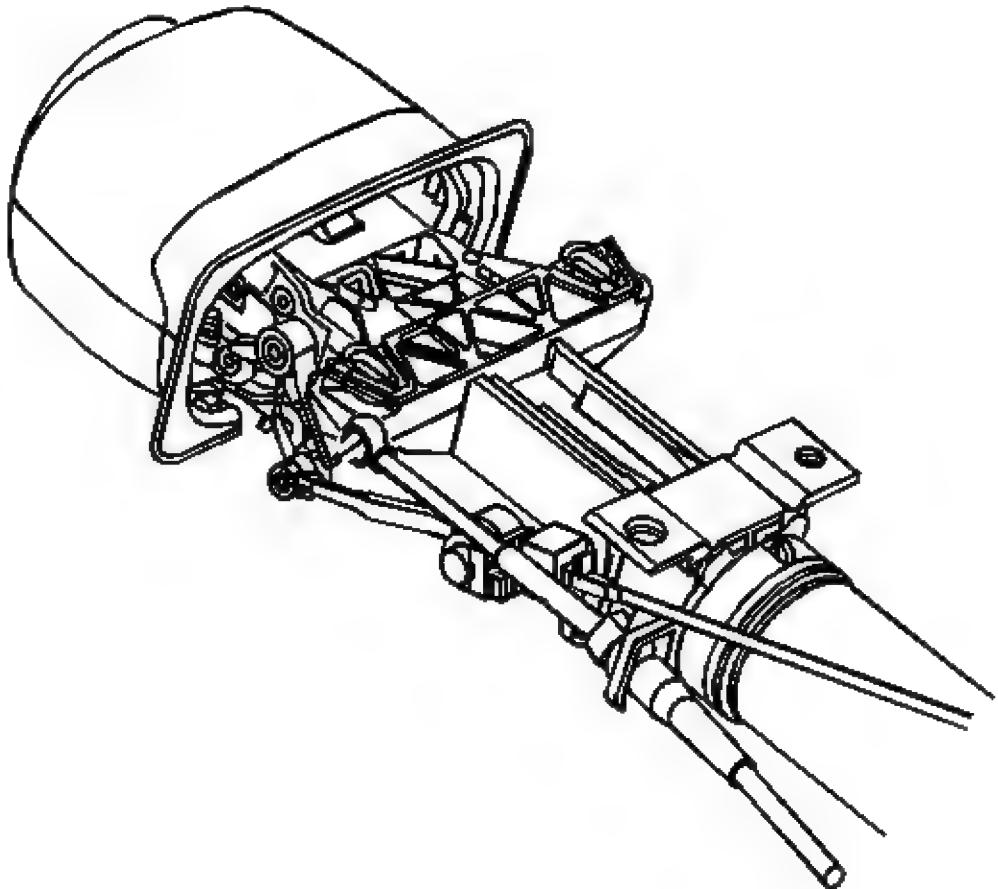


Fig. 98: View of Shift Lever Cable and Linear Shift Assembly
Courtesy of GENERAL MOTORS CORP.

7. Remove the knee bolster. Refer to [Driver Knee Bolster Replacement](#).
8. Disconnect the steering column wiring harness connector from the main body wiring harness.
9. Disconnect the shift lever cable from the linear shift assembly.

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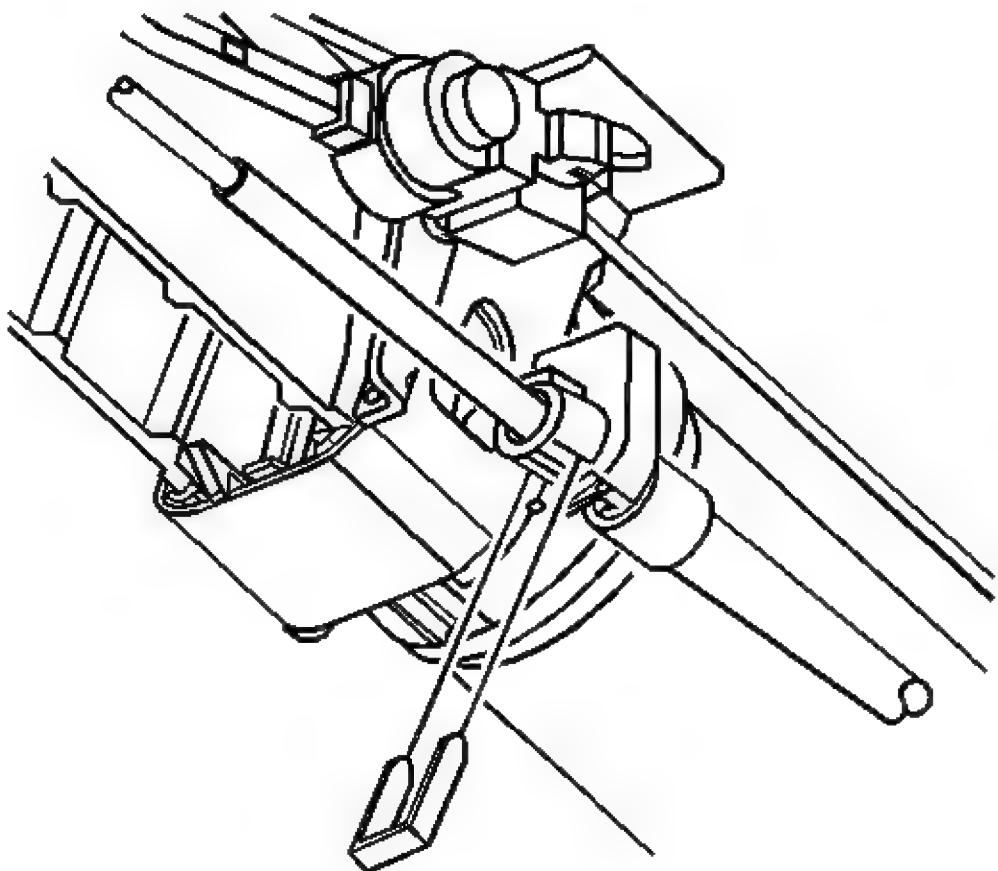


Fig. 99: View of Shift Cable Retaining Clip
Courtesy of GENERAL MOTORS CORP.

10. Remove the shift cable retaining clip.

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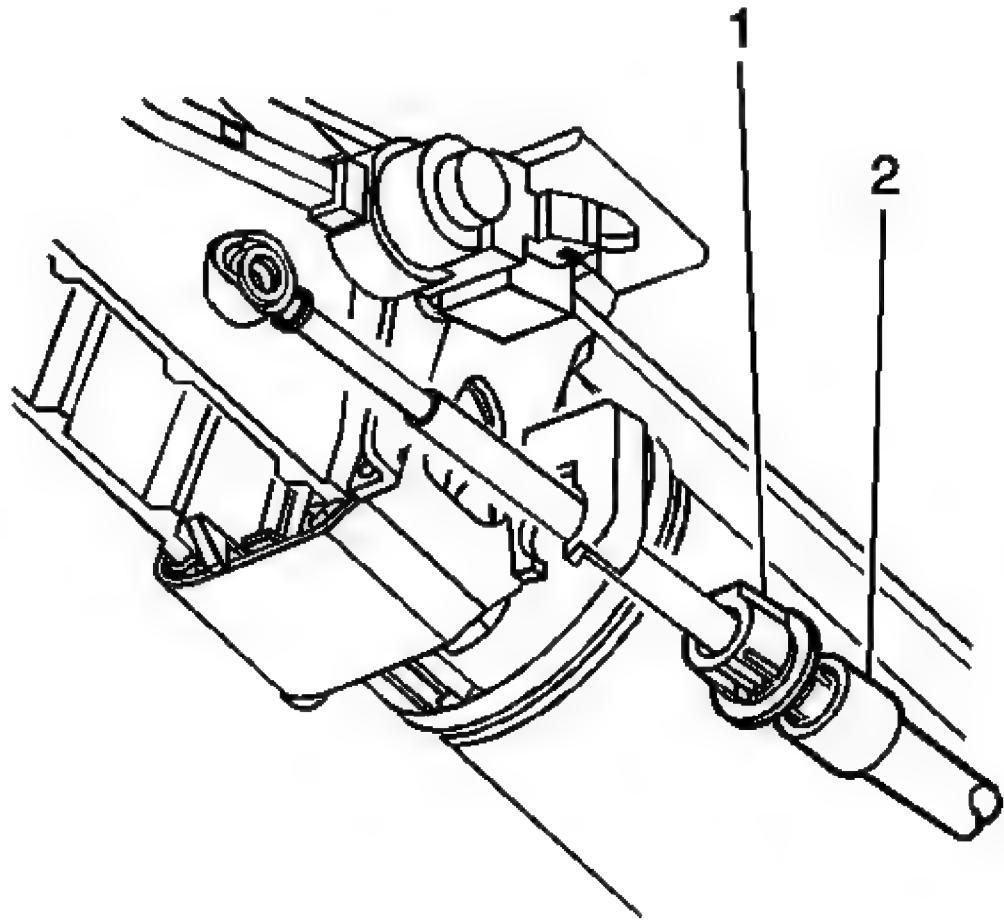


Fig. 100: View of Shift Cable Tabs and Shift Cable

Courtesy of GENERAL MOTORS CORP.

11. Press the shift cable tabs (1) together and remove the shift cable (2) from the steering column.

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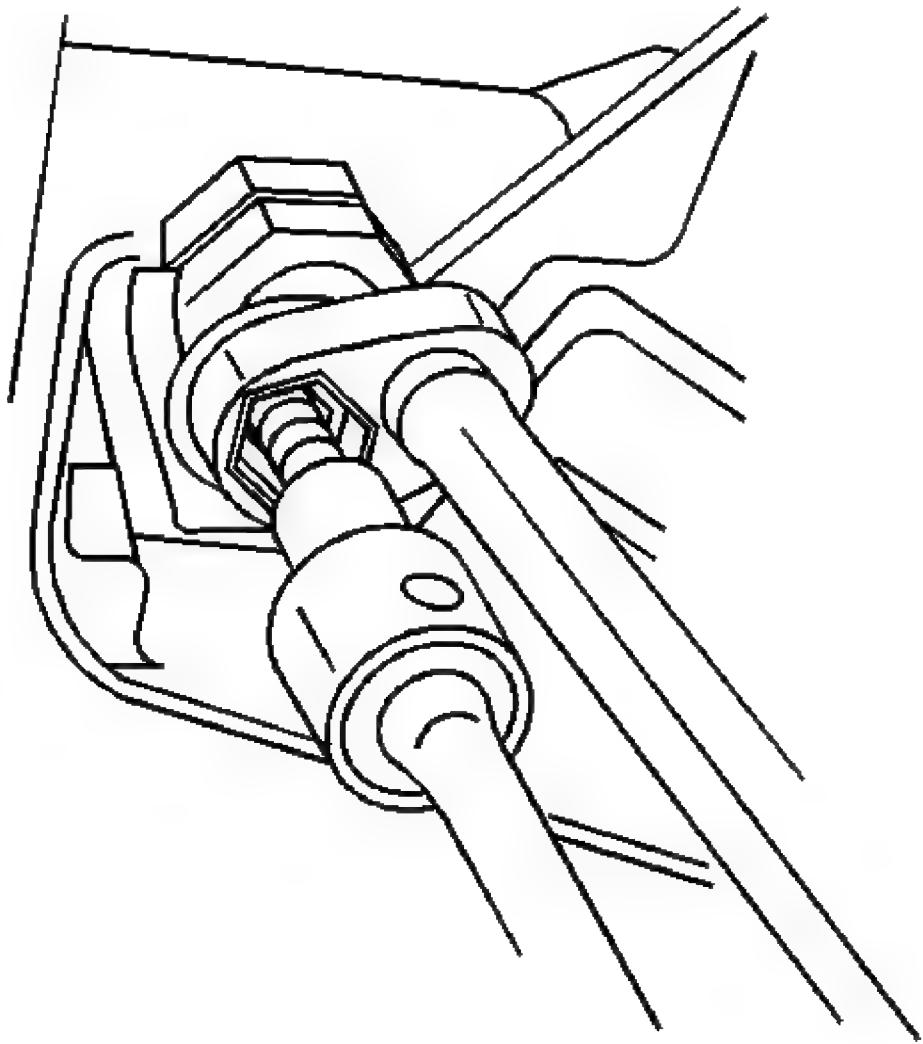


Fig. 101: Supporting Steering Column
Courtesy of GENERAL MOTORS CORP.

NOTE: The steering column should never be supported only by the lower support bracket. Damage to the lower support could result.

IMPORTANT: Stabilize the studs in order to remove the nuts securing the steering column to the instrument panel.

12. Support the column.

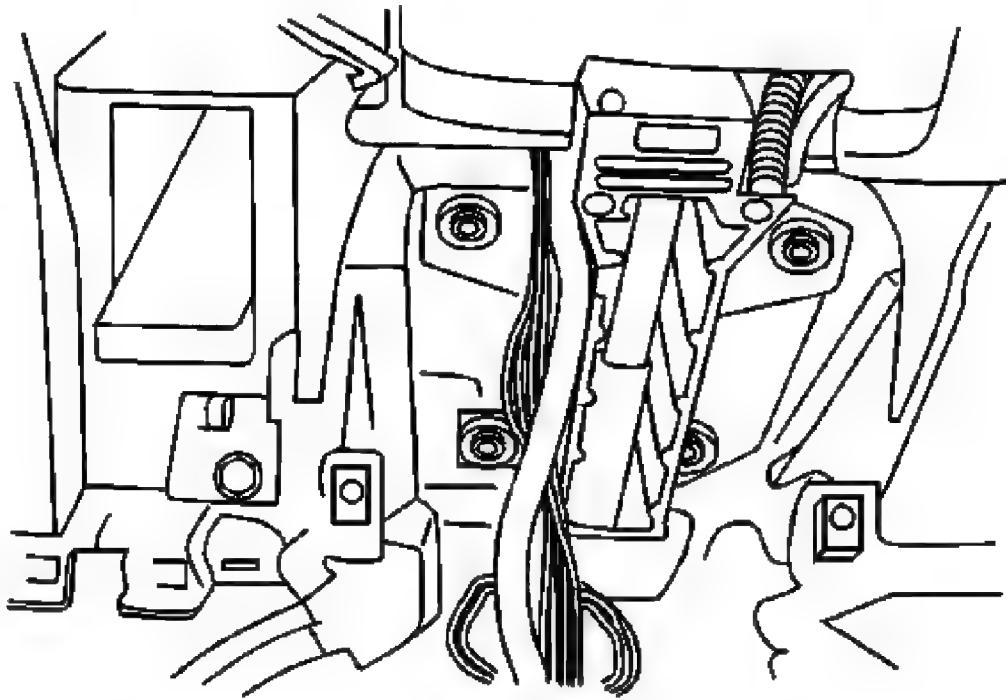


Fig. 102: View of Steering Column with J 41352
Courtesy of GENERAL MOTORS CORP.

13. Remove the lower steering column retaining nuts.
14. Remove the upper steering column retaining nuts.

IMPORTANT: Discard the clips at the upper steering column support, if equipped. These clips are for assembly plant usage only.

15. Remove the steering column from the vehicle.
16. Install the steering column to the **J 41352**. See Special Tools.

Installation Procedure

CAUTION: In order to ensure the intended function of the steering column in a vehicle during a crash and in order to avoid personal injury to the driver, perform the following:

- Tighten the steering column lower fasteners

before you tighten the steering column upper fasteners. Failure to do this can damage the steering column.

- Tighten the steering column fasteners to the specified torque. Overtightening the upper steering column fasteners could affect the steering column collapse.**

NOTE: **If a service replacement steering column is being installed, do not remove the anti-rotation pin until after the steering column has been connected to the steering gear. Removing the anti-rotation pin before the steering column is connected to the steering gear may damage the SIR coil assembly.**

NOTE: **The steering column should never be supported only by the lower support bracket. Damage to the lower support could result.**

1. Install the replacement steering column to the **J 41352** . See **Special Tools**.
2. Transfer the necessary components from the old steering column to the new column.
3. Remove the steering column from the **J 41352** . See **Special Tools**.

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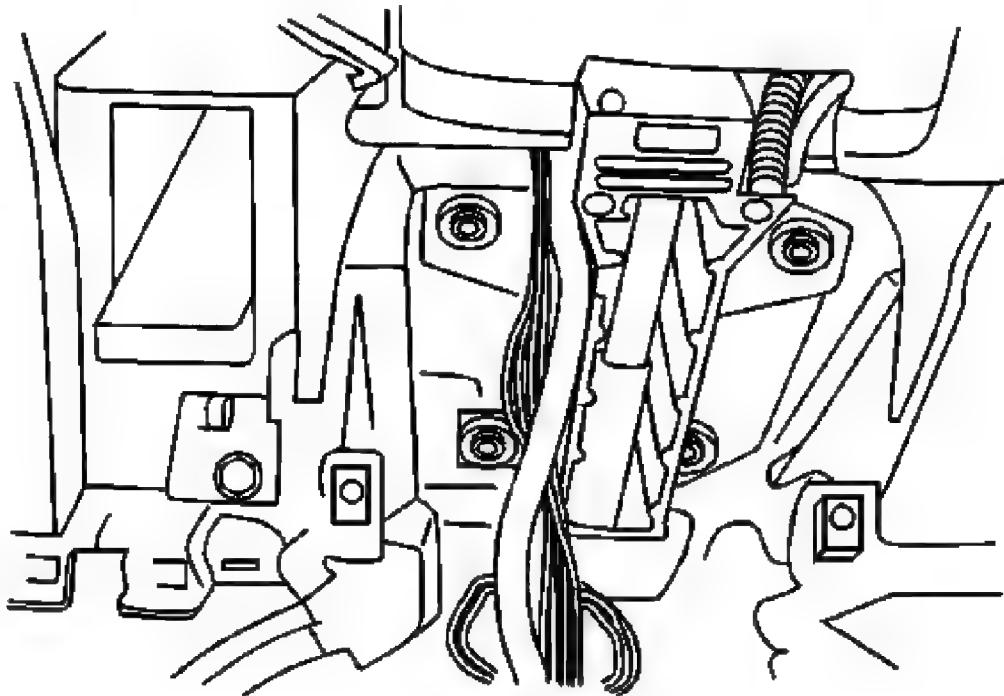


Fig. 103: View of Steering Column with J 41352
Courtesy of GENERAL MOTORS CORP.

4. Install the steering column to the vehicle.

NOTE: Refer to Fastener Notice.

IMPORTANT:

- When installing the steering column, install the fasteners needed for completing each step of the installation. DO NOT tighten the fasteners until the procedure tells you to do so.
- In order to ensure that the column absorbs energy correctly, use only the specified screws, bolts and nuts. Tighten the components to the specified torque.

5. Install the steering column and the upper and lower mounting nuts.

Tighten: Tighten the nuts to 27 N.m (20 lb ft).

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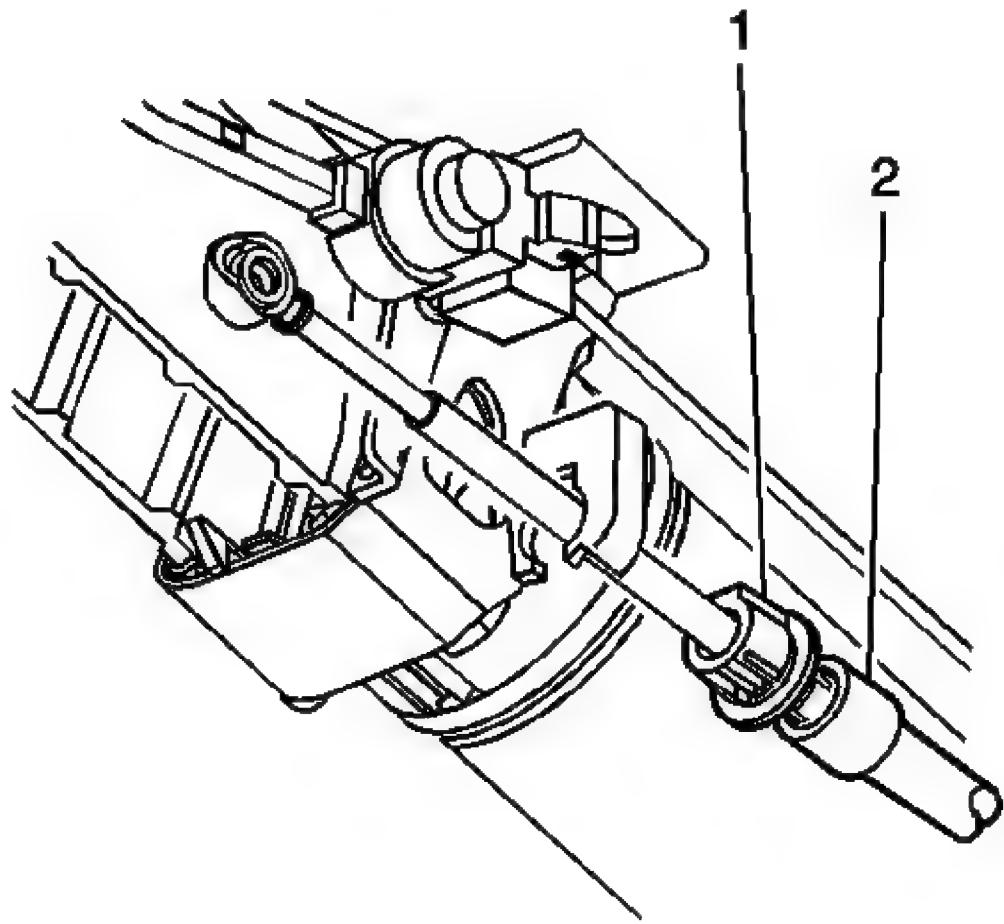


Fig. 104: View of Shift Cable Tabs and Shift Cable

Courtesy of GENERAL MOTORS CORP.

6. Connect the steering column wiring harness connector to the main body wiring harness.
7. Install the transmission shift cable (2) to the steering column.

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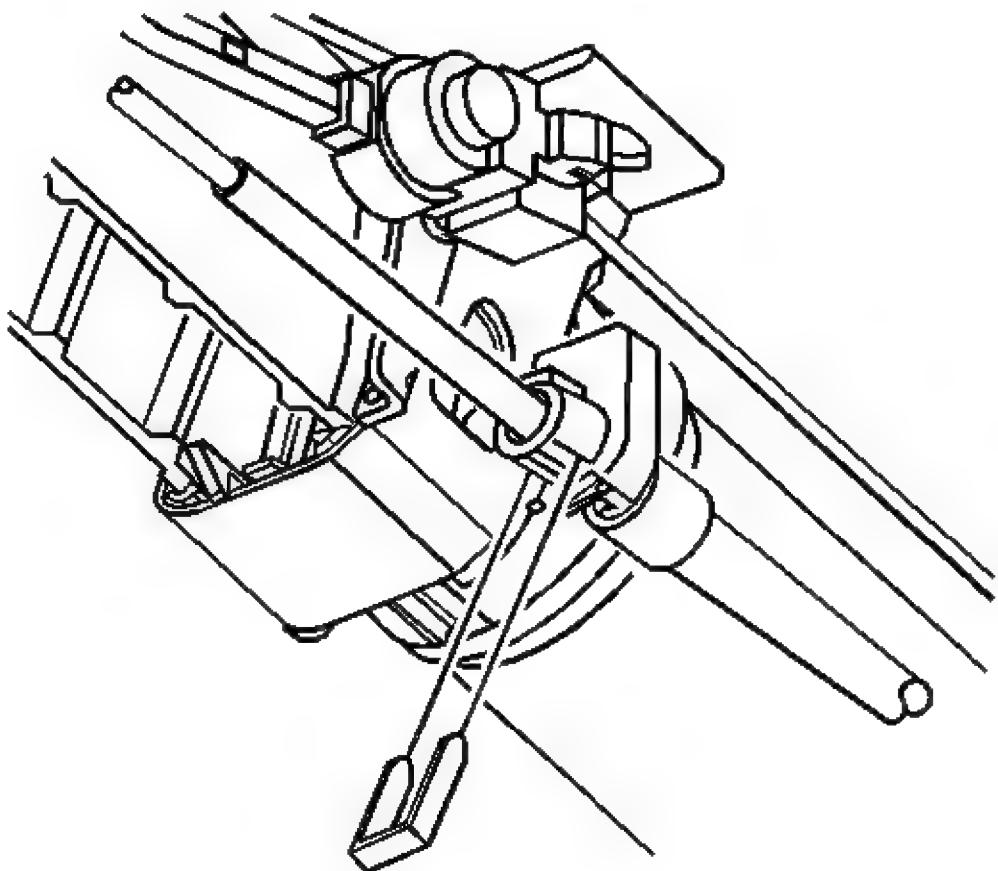


Fig. 105: View of Shift Cable Retaining Clip

Courtesy of GENERAL MOTORS CORP.

8. Install the transmission shift cable retaining clip.

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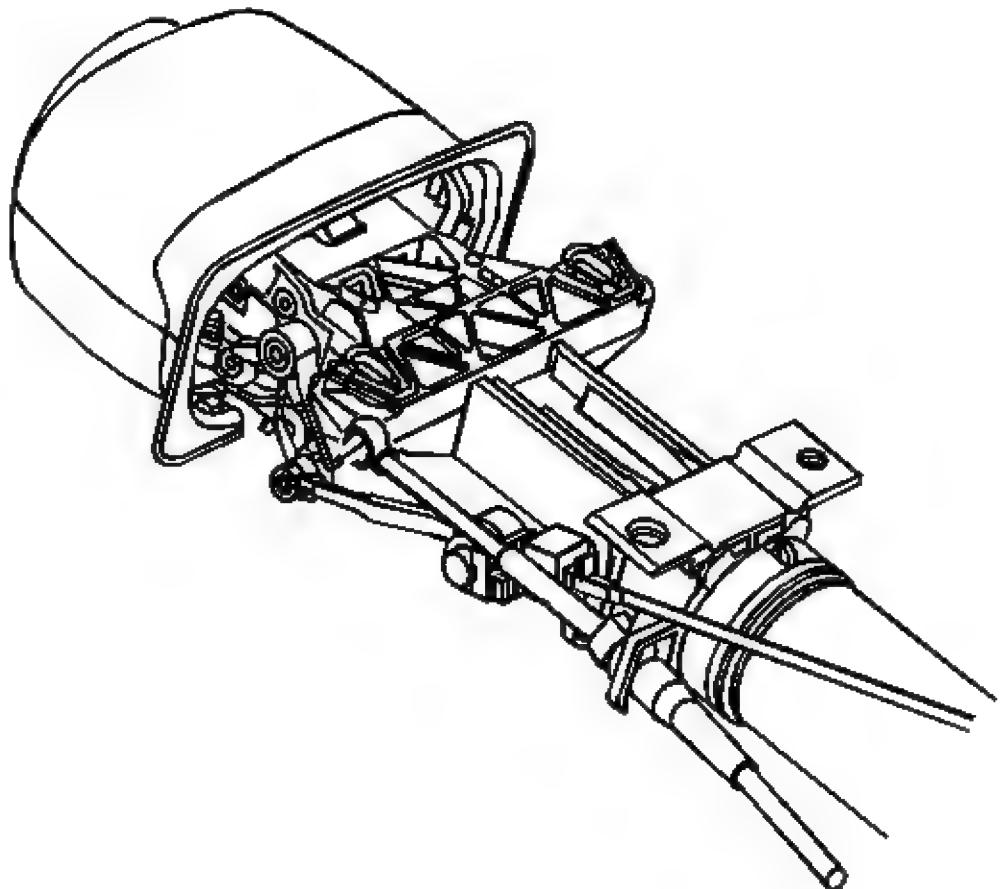


Fig. 106: View of Shift Lever Cable and Linear Shift Assembly
Courtesy of GENERAL MOTORS CORP.

9. Install the shift cable to the linear shift assembly.
10. Install the knee bolster and the bracket or the reinforcement. Refer to **Driver Knee Bolster Replacement**.
11. Raise the vehicle.

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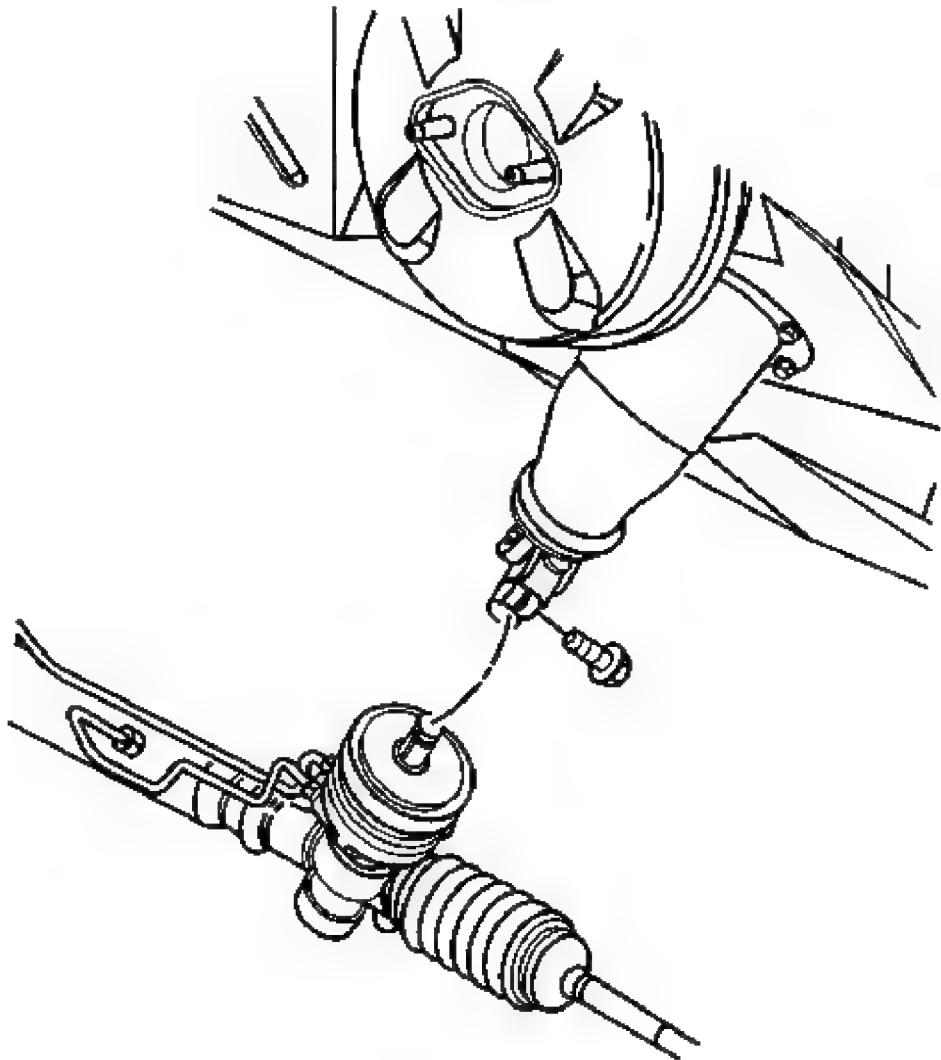


Fig. 107: Locating Steering Rack-To-Intermediate Shaft Pinch Bolt
Courtesy of GENERAL MOTORS CORP.

12. Install the intermediate shaft to the steering gear.
13. Install the intermediate shaft lower pinch bolt.

Tighten: Tighten the bolt to 47 N.m (35 lb ft).

14. Lower the vehicle.
15. Enable the SIR system. Refer to [SIR Identification Views](#).

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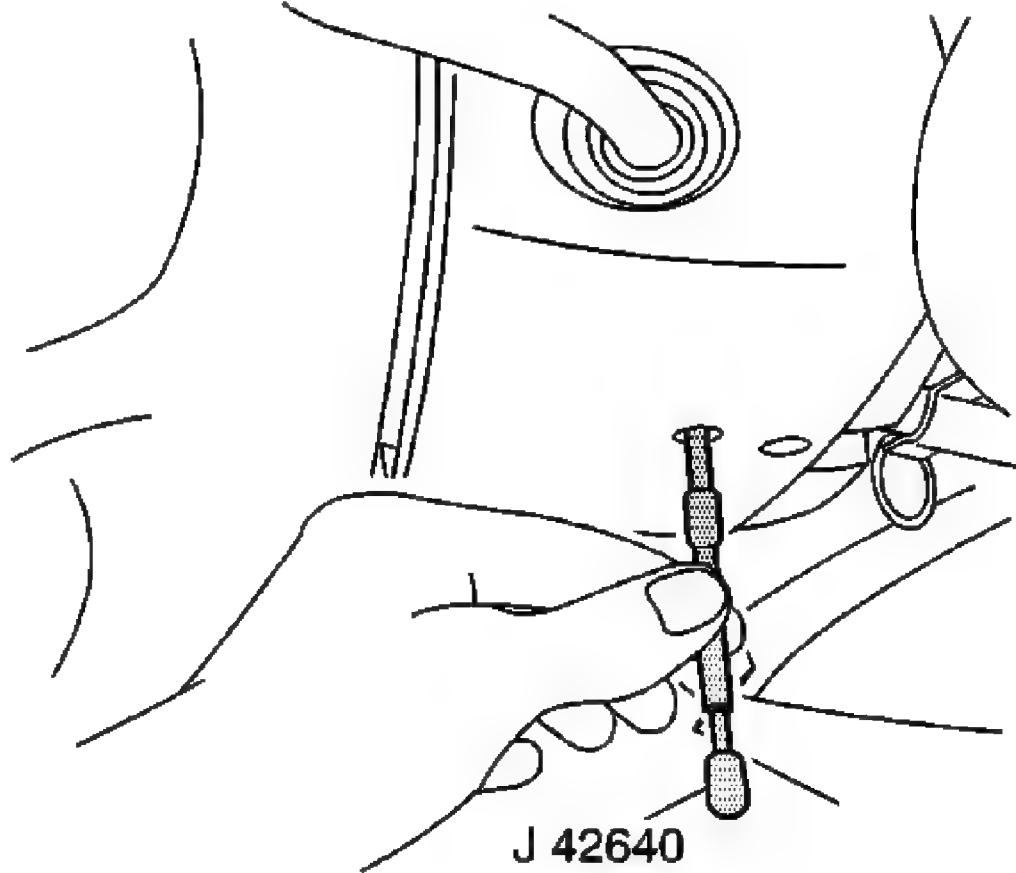


Fig. 108: Identifying J 42640
Courtesy of GENERAL MOTORS CORP.

16. Remove **J 42640** from the steering column.
17. Inspect the steering for proper operation.

STEERING COLUMN WIRING HARNESS REPLACEMENT

Removal Procedure

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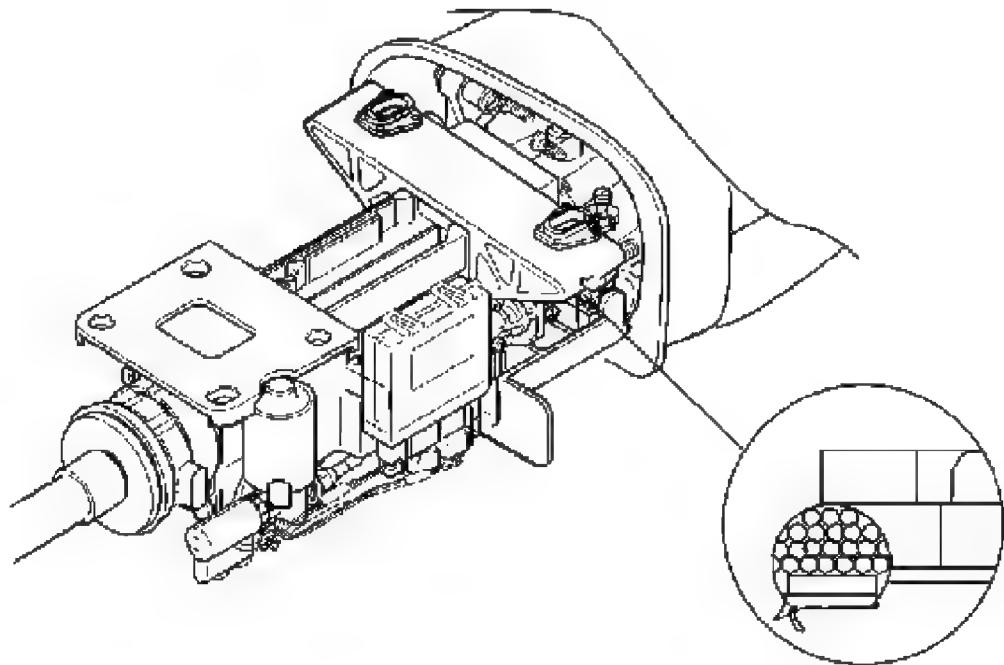


Fig. 109: Removing/Installing Plastic Mounted Steering Column Bracket
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution in Cautions and Notices.

1. Disable the SIR system. Refer to [SIR Disabling and Enabling](#) in SIR.
2. Remove the upper and lower trim covers. Refer to [Steering Column Trim Covers Replacement](#)
3. Remove the wire harness strap.

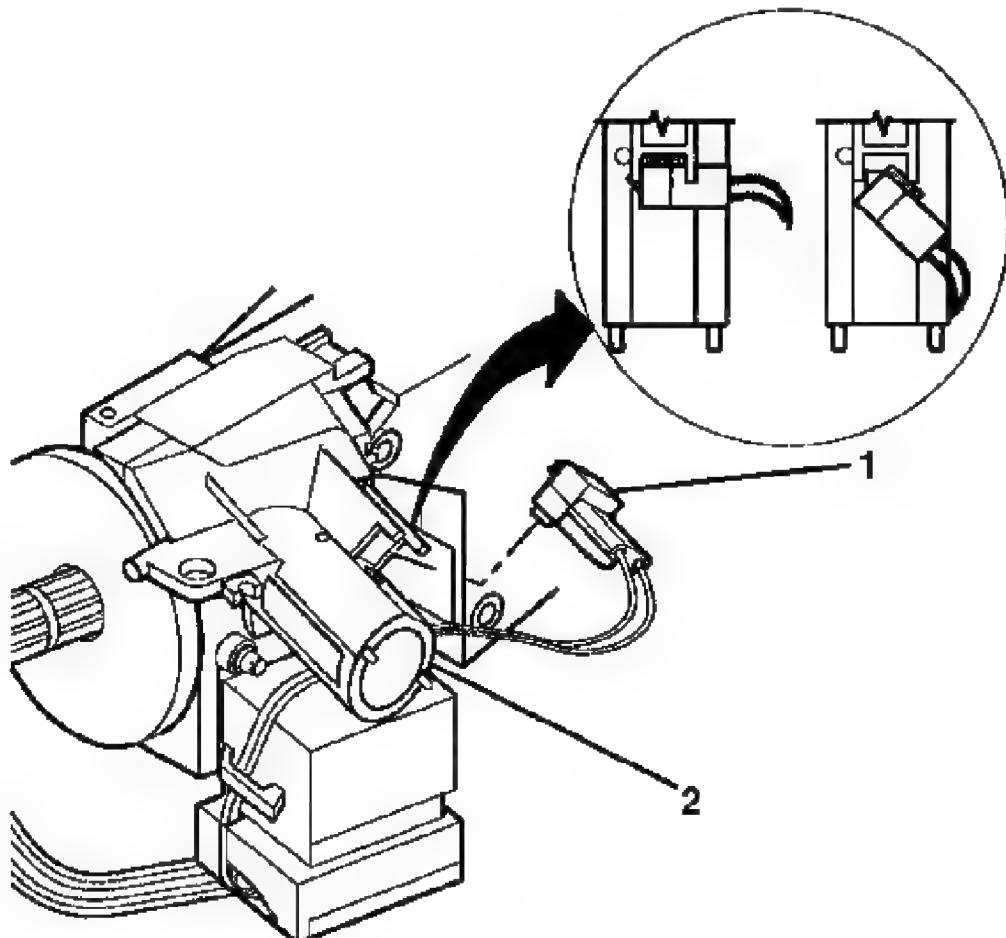


Fig. 110: Identifying Key Alarm Connector At Ignition Lock Cylinder Case
Courtesy of GENERAL MOTORS CORP.

4. Remove the theft deterrent control module. Refer to [Theft Deterrent Module Replacement](#) in Theft Deterrent.
5. Rotate the key alarm connector (1) 90 degrees.
6. Gently pull the key alarm connector (1) out of the ignition lock cylinder case assembly (2).
7. Disconnect the connector from the ignition switch assembly.
8. Remove the wires encased in the ignition switch clip located on the side of the ignition switch.

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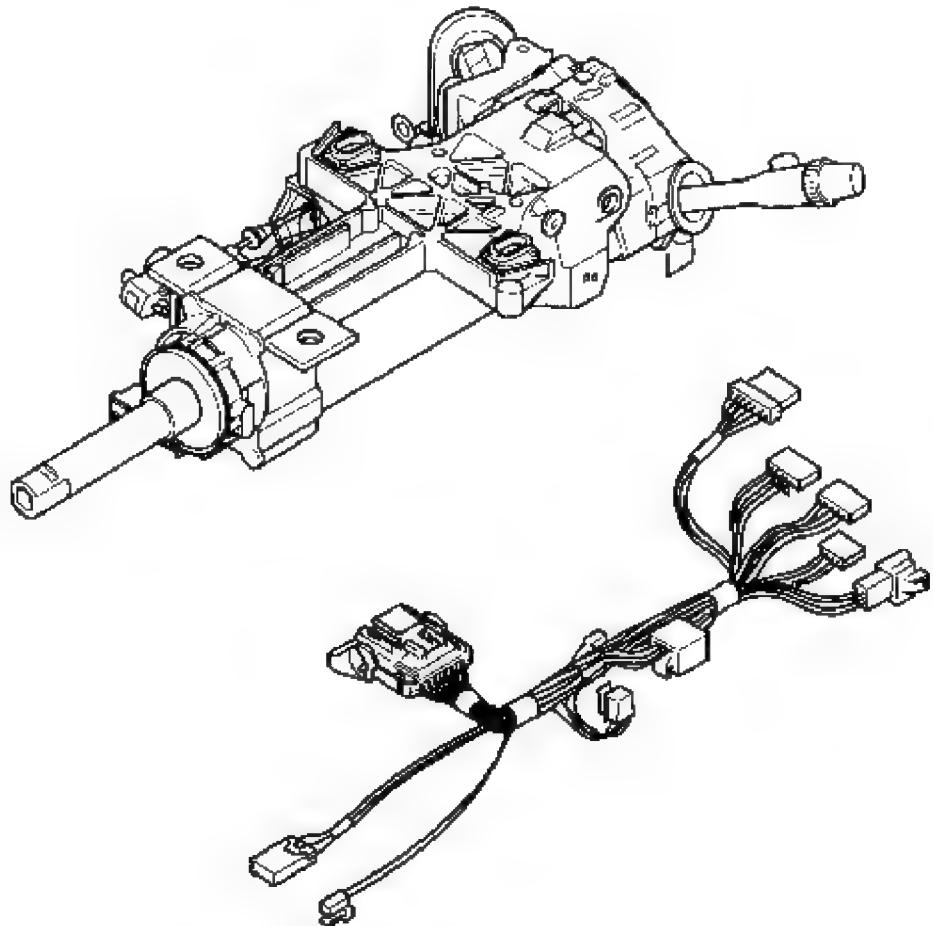


Fig. 111: View Of Steering Column And Wire Harness Assembly
Courtesy of GENERAL MOTORS CORP.

9. Disconnect all connectors attached to the wire harness assembly.

Installation Procedure

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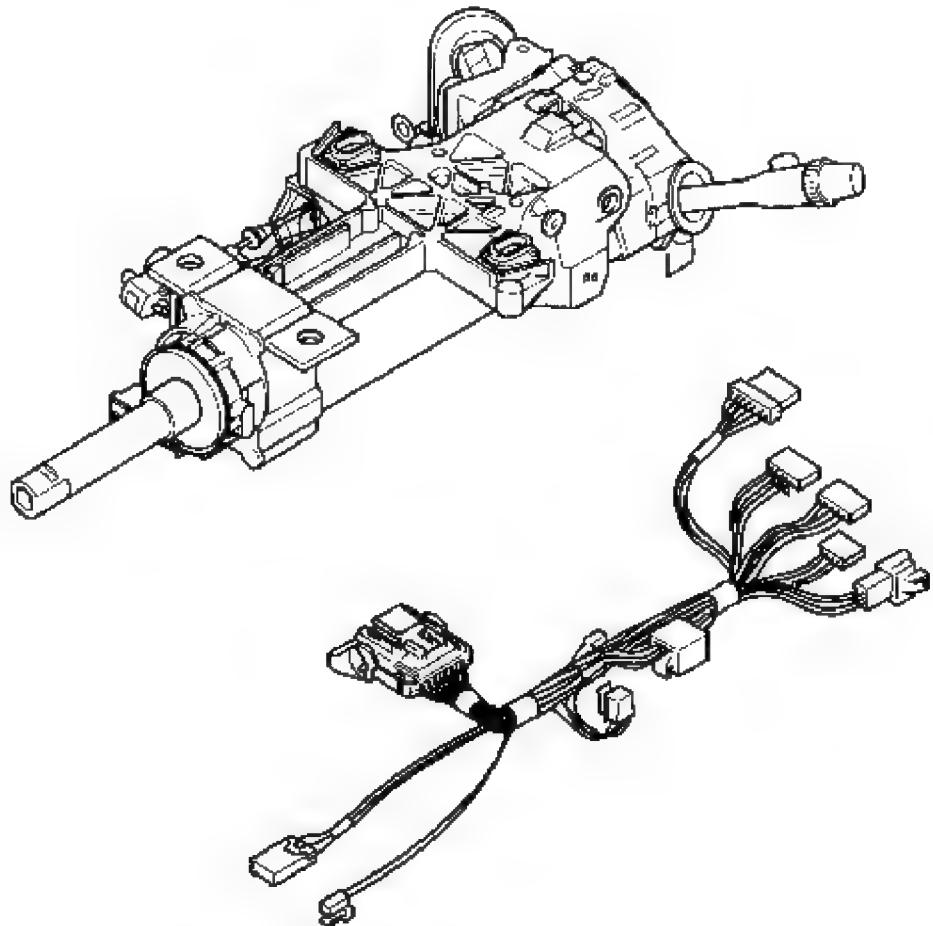


Fig. 112: View Of Steering Column And Wire Harness Assembly
Courtesy of GENERAL MOTORS CORP.

1. Connect all of the connectors from the new wire harness assembly.

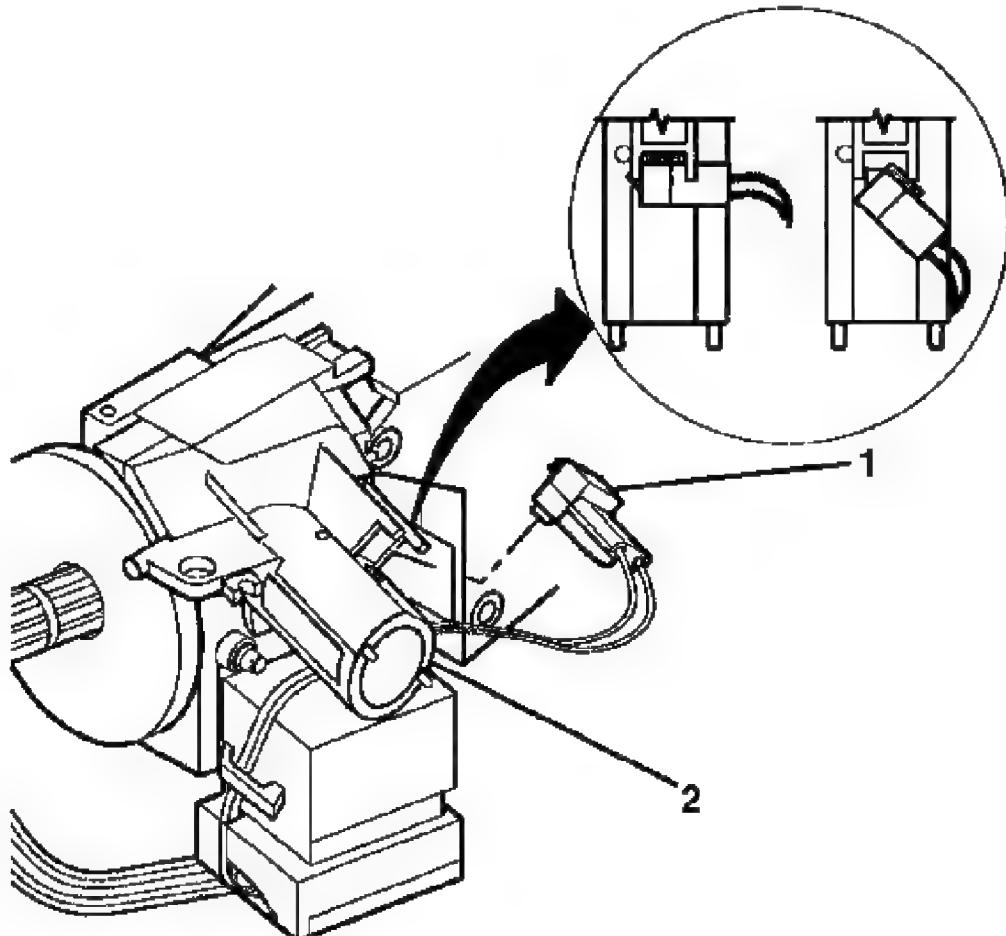


Fig. 113: Identifying Key Alarm Connector At Ignition Lock Cylinder Case
Courtesy of GENERAL MOTORS CORP.

2. Push the key alarm connector (1) into the ignition lock cylinder case assembly (2).
3. Rotate the key alarm connector (1) 90 degrees so that the key alarm connector (1) locks into place.
4. Install the theft deterrent control module. Refer to **Theft Deterrent Module Replacement** in Theft Deterrent.

CAUTION: Refer to SIR INFLATOR MODULE COIL CAUTION in Cautions and Notices.

5. Install the wires back into the ignition switch clip located on the side of the ignition switch.

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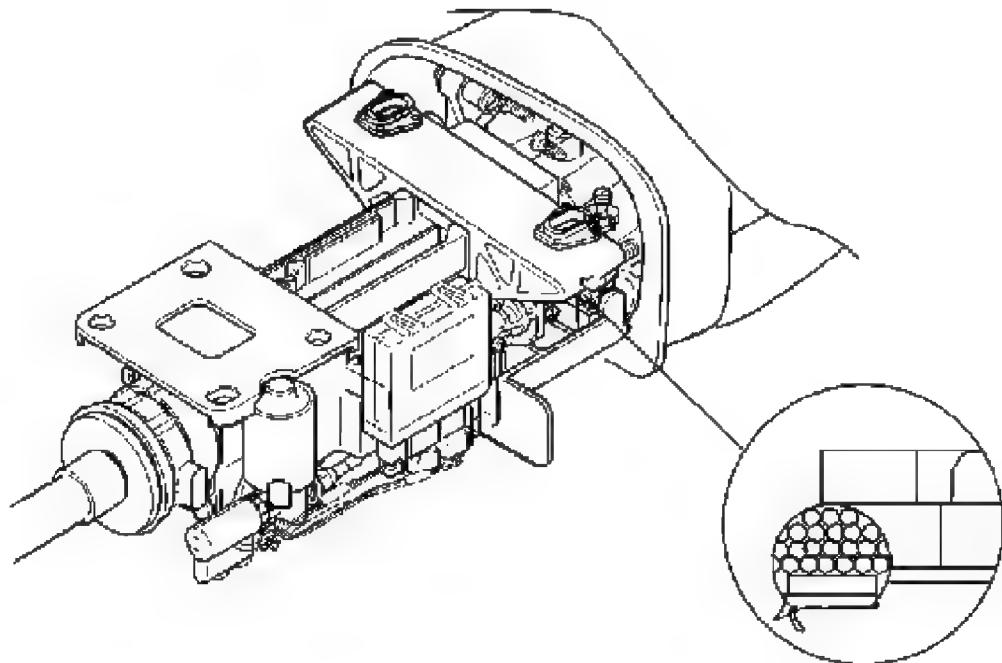


Fig. 114: Removing/Installing Plastic Mounted Steering Column Bracket
Courtesy of GENERAL MOTORS CORP.

6. Install the wire harness strap.
7. Install the upper and lower trim covers. Refer to [Steering Column Trim Covers Replacement](#).
8. Enable the SIR system. Refer to [SIR Disabling and Enabling](#) in SIR.

STEERING WHEEL POSITION SENSOR REPLACEMENT

Removal Procedure

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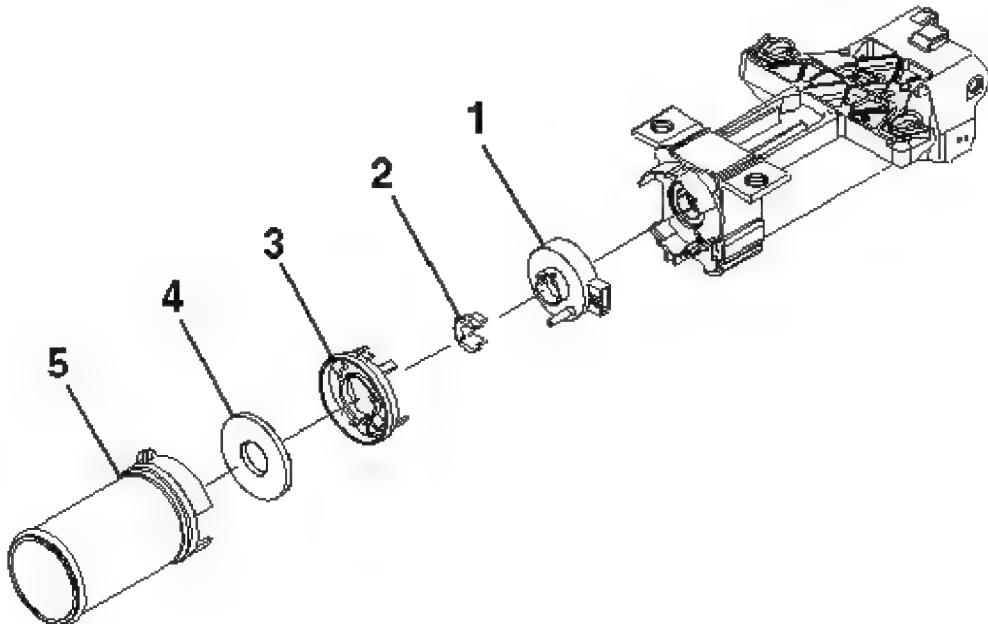


Fig. 115: Identifying Lower Steering Column Components
Courtesy of GENERAL MOTORS CORP.

CAUTION: Refer to SIR Caution .

1. Disable the SIR system. Refer to **SIR Disabling and Enabling** .
2. Remove the steering column from the vehicle. Refer to **Steering Column Replacement** .
3. Remove the following from the steering shaft:
 1. The boot seal (5)
 2. The steering shaft seal (4)
 3. The sensor retainer (3)
 4. The sensor locator (2)
4. Remove the steering wheel position sensor (1). Refer to **Steering Wheel Position Sensor Centering** .

Installation Procedure

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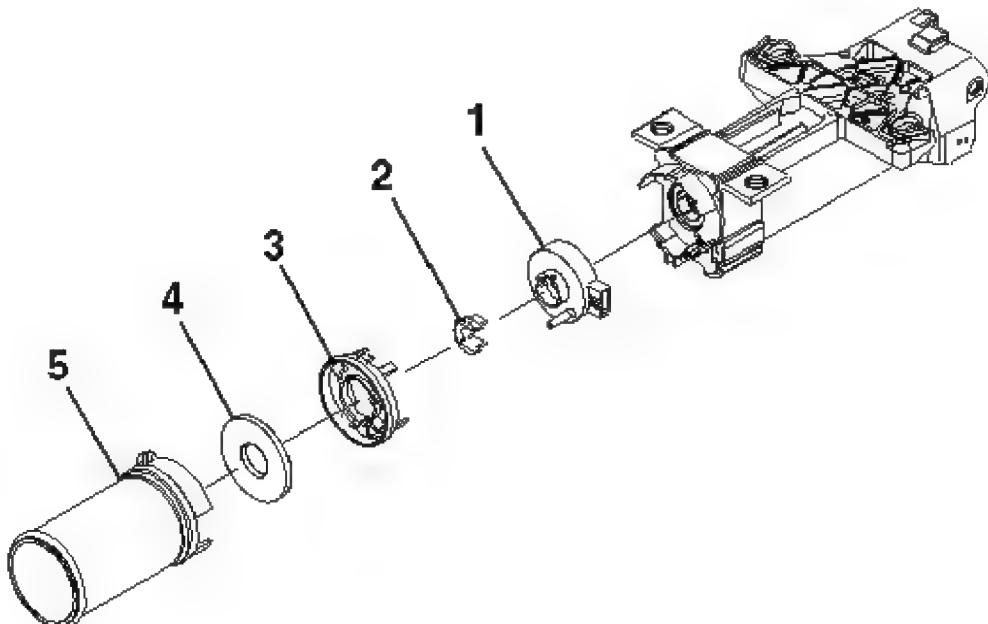


Fig. 116: Identifying Lower Steering Column Components
Courtesy of GENERAL MOTORS CORP.

1. Install the following onto the steering shaft:
 1. The steering wheel position sensor (1)- Refer to [Steering Wheel Position Sensor Centering](#).
 2. The sensor locator (2)
 3. The sensor retainer (3)
 4. The steering shaft seal (4)
 5. The boot seal (5)
2. Install the steering column into the vehicle. Refer to [Steering Column Replacement](#).
3. Enable the SIR system. Refer to [SIR Disabling and Enabling](#).

STEERING WHEEL POSITION SENSOR CENTERING

Removal Procedure

IMPORTANT: Identify the type of steering wheel position sensor from the illustrations shown BEFORE removing the sensor from the steering column. Once you have identified the steering

wheel position sensor, follow the instructions listed in the removal procedure.

1. Verify the type of steering wheel position sensor.

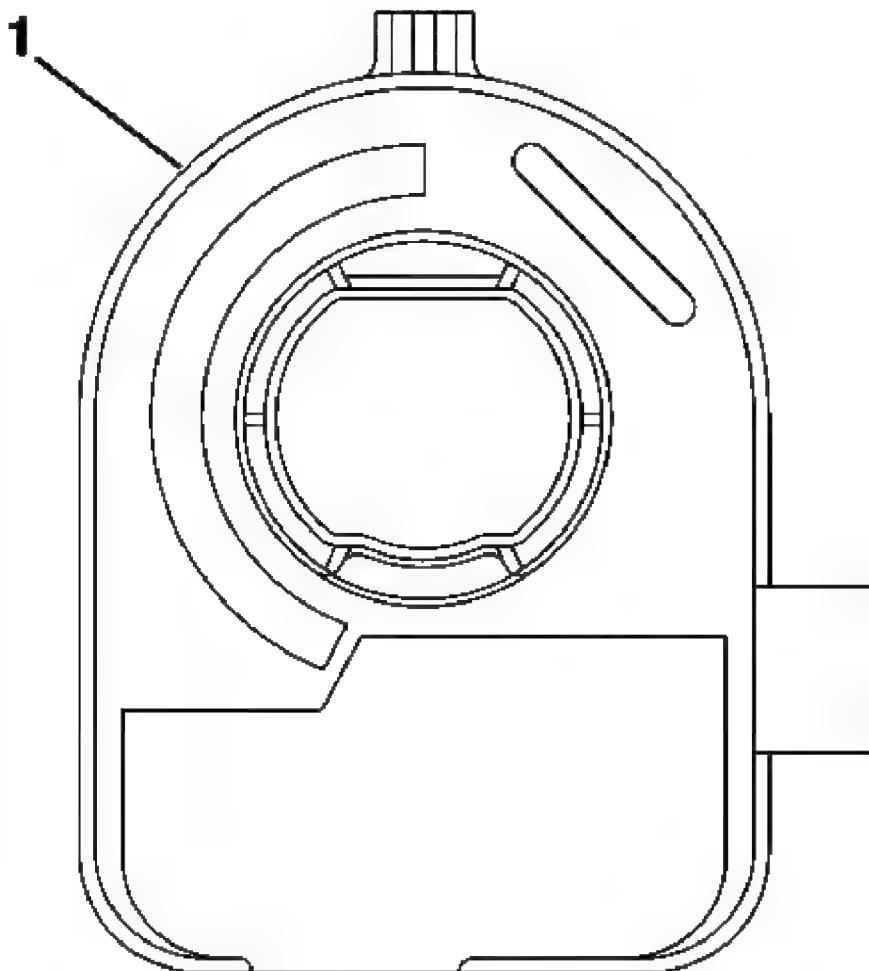


Fig. 117: View Of Steering Wheel Position Sensor
Courtesy of GENERAL MOTORS CORP.

2. From the technicians point of view, the FRONT of the sensor (1) connector will be on the right.

IMPORTANT: If reusing the existing sensor, you do not have to align the sensor before removal. Centering is not required when it is

time to reinstall.

3. Remove the connector from the sensor.
4. Remove the sensor (1) from the adapter and bearing assembly.
5. To install the sensor, proceed to step 1 in the installation procedure.

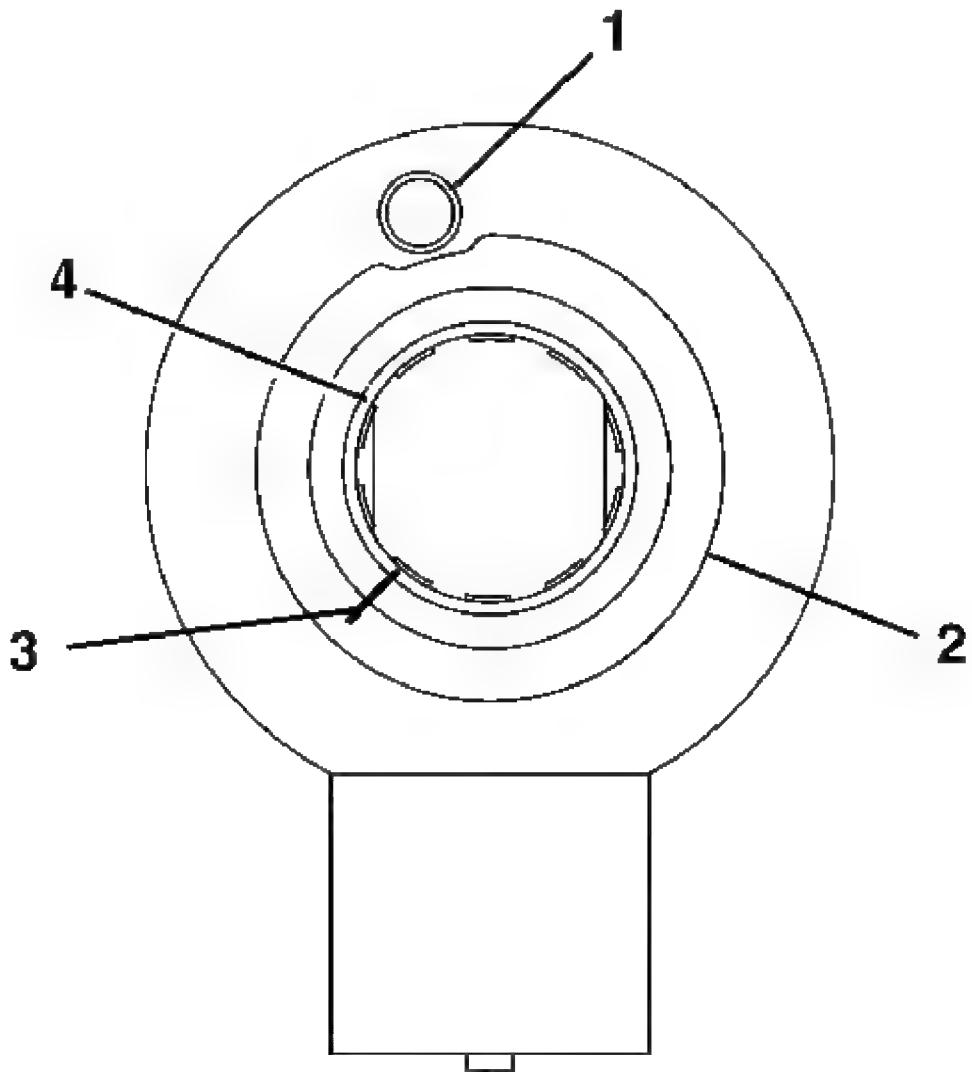


Fig. 118: Identifying Steering Wheel Position Sensor Components
Courtesy of GENERAL MOTORS CORP.

6. From the technicians point of view, the FRONT of the sensor will have:

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- A foam ring (2)
- A pin hole (1) for centering the pin-Note the location of the pin hole.
- A flush rotor flange cuff (4)

IMPORTANT: If reusing the existing sensor, you must make an alignment mark on the rotor flange cuff (3) before removing the sensor. Failure to do so will cause misalignment when installing the sensor. A new sensor will be required if misaligned.

7. Make an alignment mark on the flush rotor flange cuff (3).
8. Remove the connector from the sensor.
9. Remove the sensor from the adapter and bearing assembly.
10. To install the sensor, proceed to step 5 in the installation procedure.

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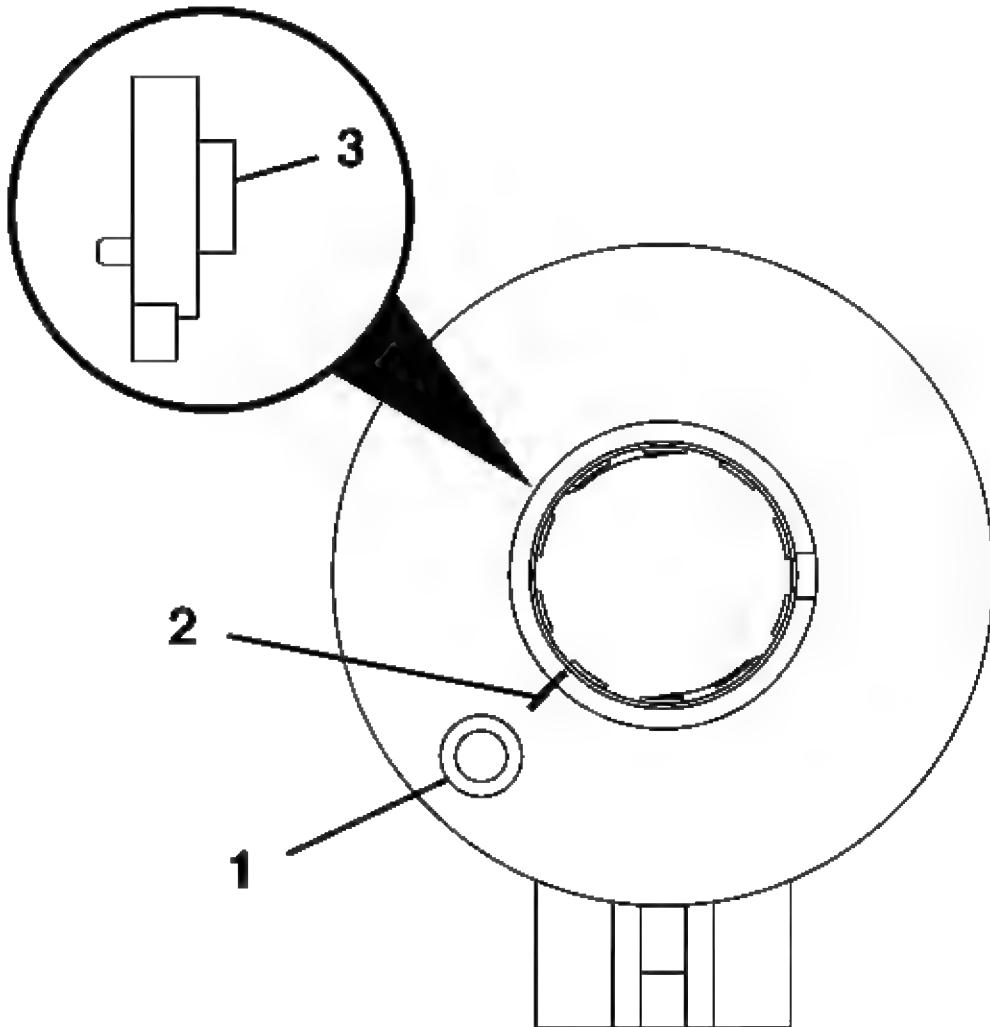


Fig. 119: Identifying Steering Wheel Position Sensor Alignment Mark
Courtesy of GENERAL MOTORS CORP.

11. From the technicians point of view, the FRONT of the sensor will have:
 - A raised rotor flange cuff (3)
 - An alignment mark (2) on the rotor flange cuff (3) for installation
 - A pin hole (1) for the centering pin-Note the location of the pin hole.
12. Remove the connector from the sensor.
13. Remove the sensor from the adapter and bearing assembly.
14. To install the sensor, proceed to step 9 in the installation procedure.

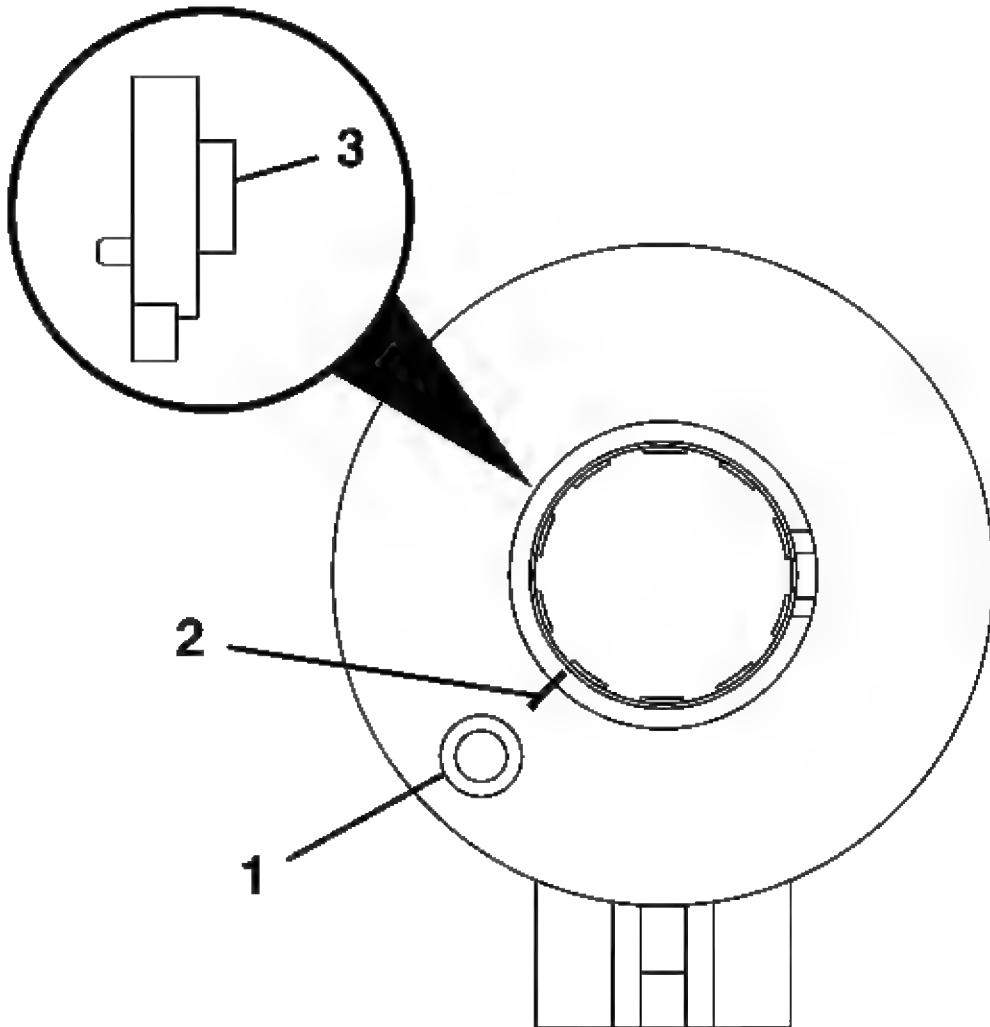


Fig. 120: Identifying Steering Wheel Position Sensor Alignment Mark
Courtesy of GENERAL MOTORS CORP.

15. From the technicians point of view, the FRONT of the sensor will have:
 - A raised rotor flange cuff (3)
 - An alignment mark (2) on the rotor flange cuff (3) for installation
 - A pin hole (1) for the centering pin-Note location of the pin hole.
 - A sensor clip in FRONT of the sensor
16. Remove the connector from the sensor.
17. Remove the sensor clip from the sensor.

18. Remove the sensor from the adapter and bearing assembly.
19. To install the sensor, proceed to step 13 in the installation procedure.

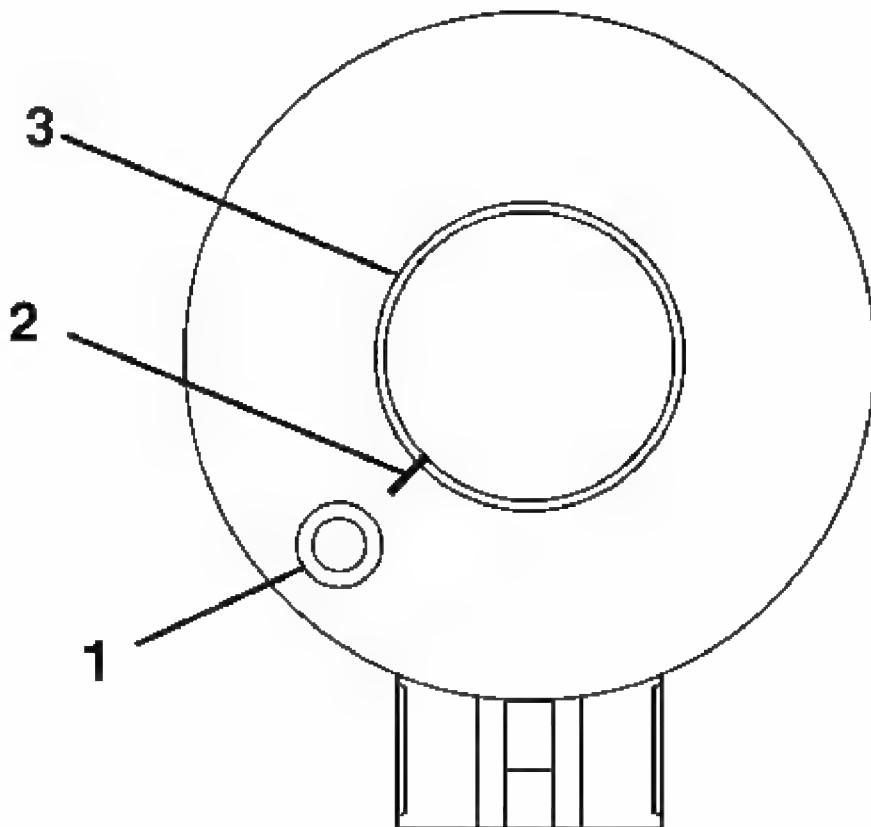


Fig. 121: View Of Steering Wheel Position Sensor Rotor Flange Cuff, Centering Pin Hole & Alignment Mark

Courtesy of **GENERAL MOTORS CORP.**

20. From the technicians point of view, the FRONT of the sensor will have:
 - A flush rotor flange cuff (3)
 - A pin hole (1) for the centering pin-Note the location of the pin hole.
 - An alignment mark (2) on the flush rotor flange cuff (3) for installation
21. Remove the connector from the sensor.
22. Remove the sensor from the adapter and bearing assembly.
23. To install the sensor, proceed to step 17 in the installation procedure.

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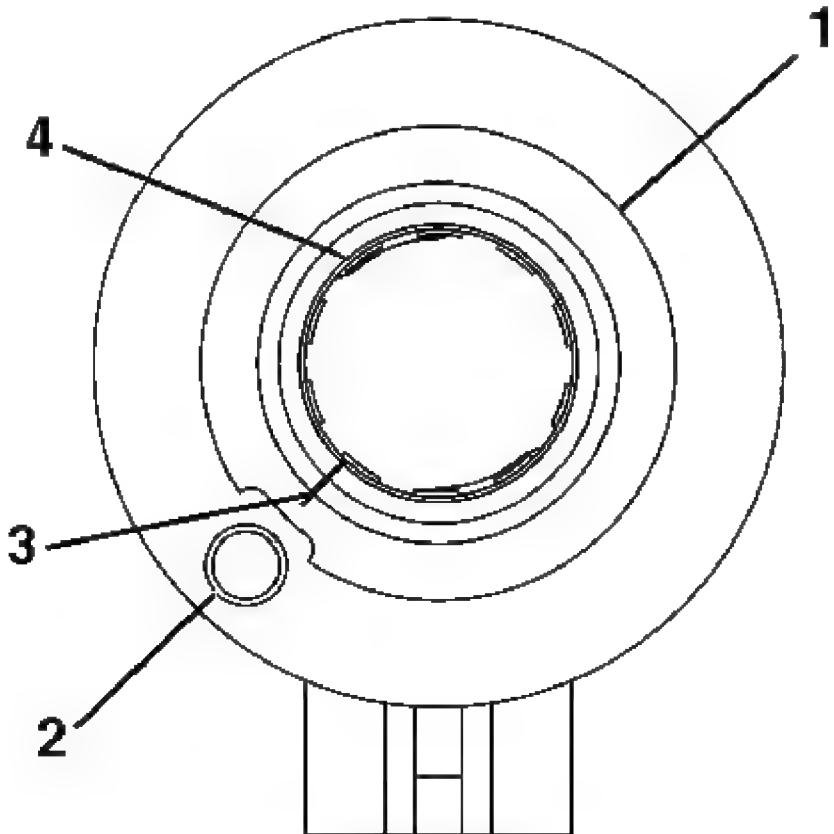


Fig. 122: Steering Wheel Position Sensor Identification Points (With Flush Rotor Flange Cuff & Foam Ring)

Courtesy of GENERAL MOTORS CORP.

24. From the technicians point of view, the FRONT of the sensor will have:
 - A flush rotor flange cuff (4)
 - A pin hole (2) for the centering pin-Note the location of the pin hole.
 - An alignment mark (3) on the flush rotor flange cuff (4) for installation
 - A foam ring (1)
25. Remove the connector from the sensor.
26. Remove the sensor from the adapter and bearing assembly.
27. To install the sensor, proceed to step 21 in the installation procedure.

Installation Procedure

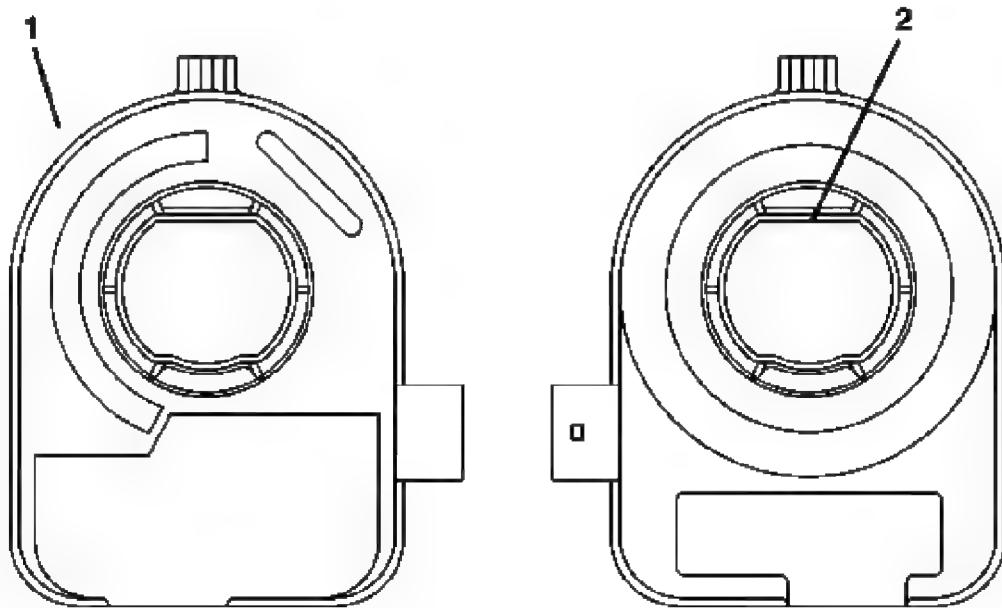


Fig. 123: Identifying Front & Back Views Of Steering Wheel Position Sensor
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: If reusing the existing sensor, no centering of the sensor is required.

1. If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated.
2. From the technicians point of view, the FRONT of the sensor (1) connector will be on your right.

From the technicians point of view, the BACK of the sensor (2) connector will be on your left.

3. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
4. Install the connector to the sensor.

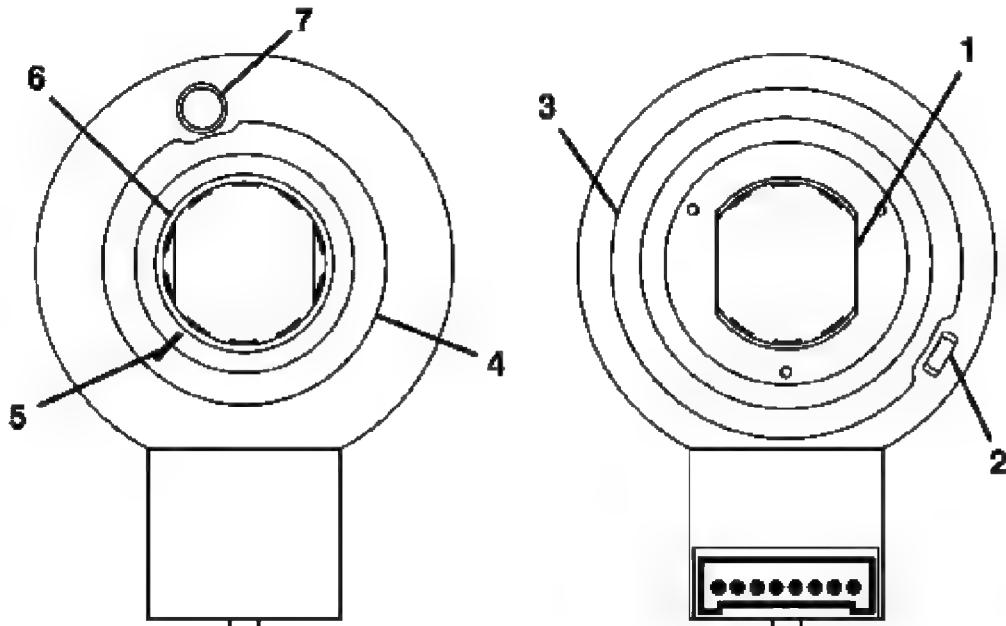


Fig. 124: Verifying Steering Wheel Position Sensor Identification Points
Courtesy of GENERAL MOTORS CORP.

5. From the technicians point of view, the FRONT of the sensor will have:
 - A foam ring (4)
 - A pin hole (7) for the centering pin-Note the location of the pin hole.
 - A flushed rotor flange cuff (6)
 - An alignment mark (5) for installation
6. From the technicians point of view, the BACK of the sensor will have:
 - Double D flats (1)
 - A foam ring (3)
 - An alignment tab (2) for installing into the adapter and bearing assembly
 - A view of the inside of the connector

IMPORTANT: If reusing the existing sensor, you must align the marks on the flush rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly. If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is

seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

7. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
8. Install the connector to the sensor.

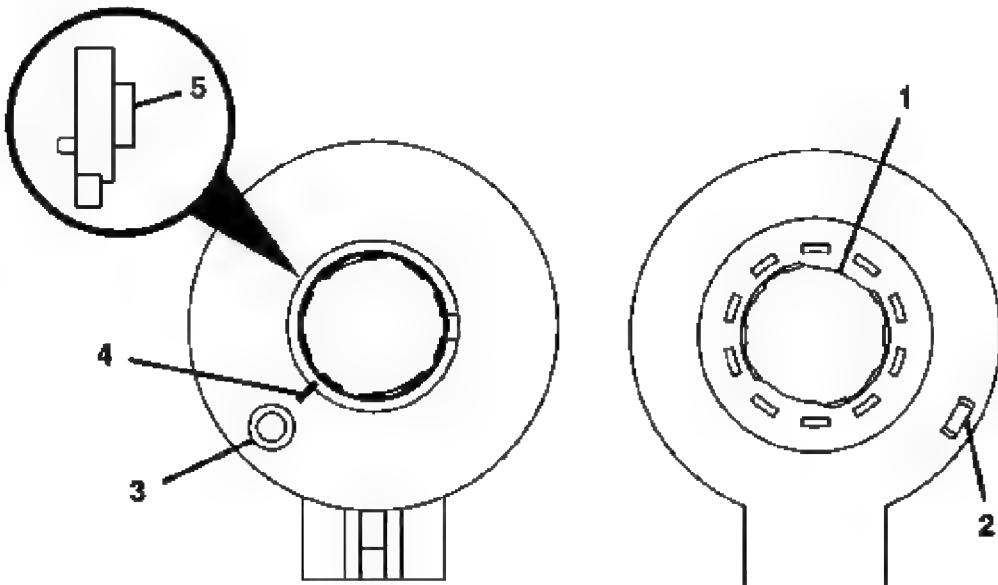


Fig. 125: Checking Alignment Of Steering Wheel Position Sensor (Front View)
Courtesy of GENERAL MOTORS CORP.

9. From the technicians point of view, the FRONT of the sensor will have:
 - A pin hole (3) for the centering pin-Note location of the pin hole.
 - A raised rotor flange cuff (5)
 - An alignment mark (4) for installation
10. From the technicians point of view, the BACK of the sensor will have:
 - Double D flats (1)
 - An alignment tab (2) for installing into the adapter and bearing assembly

IMPORTANT: If reusing the existing sensor, you must align the marks on the raised rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is

seated into the adapter and bearing assembly. If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

11. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
12. Install the connector to the sensor.

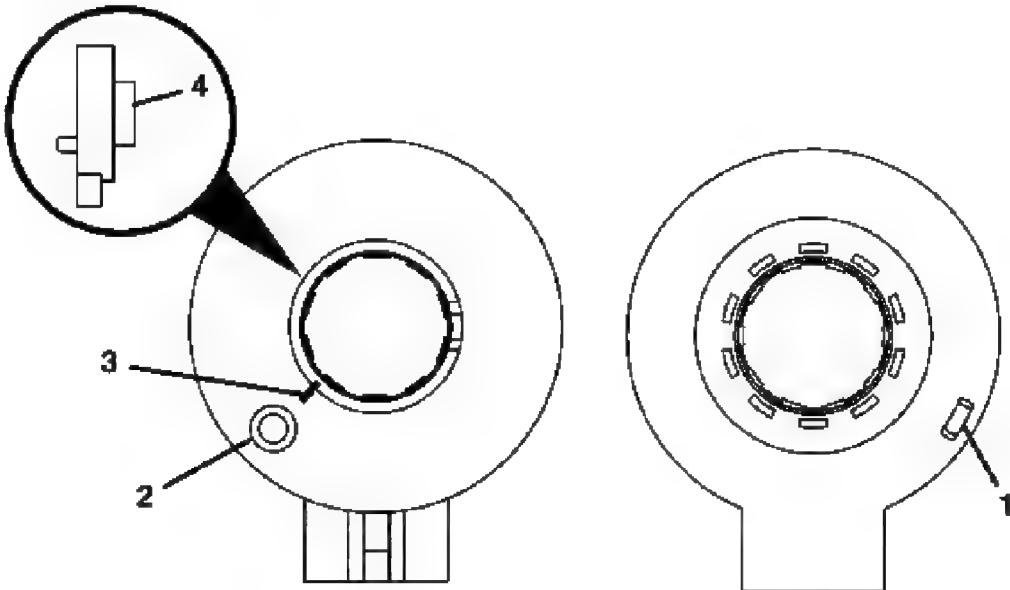


Fig. 126: Identifying Steering Wheel Position Sensor Centering Pin Hole, Rotor Flange Cuff & Alignment Mark

Courtesy of GENERAL MOTORS CORP.

13. From the technicians point of view, the FRONT of the sensor will have:
 - A pin hole (2) for the centering pin-Note the location of the pin hole.
 - A raised rotor flange cuff (4)
 - An alignment mark (3) for installation
14. From the technicians point of view, the BACK of the sensor will have an alignment tab (1) for installation. This sensor does not have double D flats.

IMPORTANT: If reusing the existing sensor, you must align the marks on

the raised rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly.

If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

15. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
16. Install the connector to the sensor.

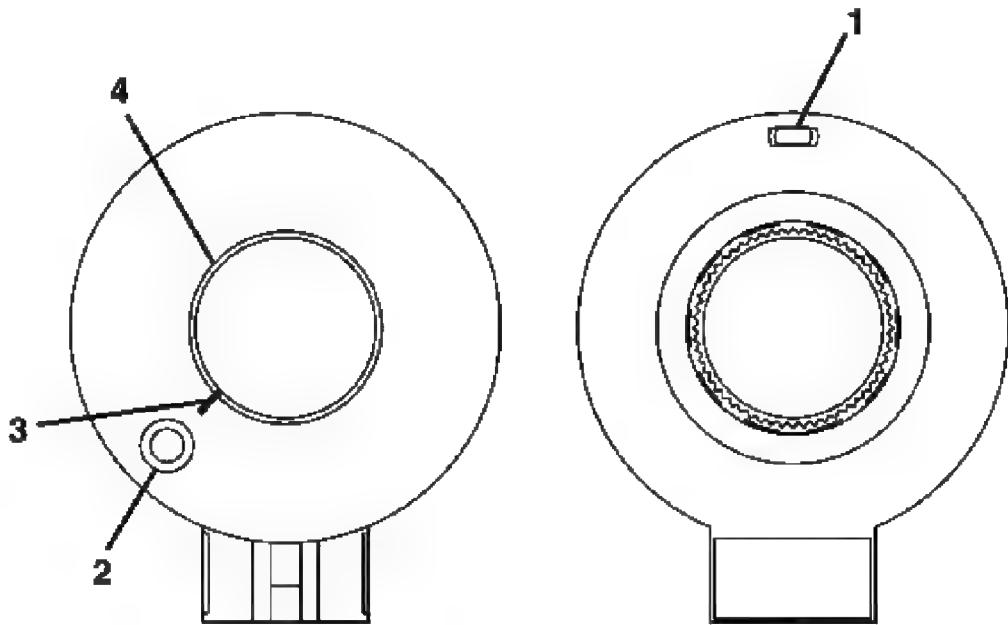


Fig. 127: Identifying Steering Wheel Position Sensor Center Pin, Rotor Flange Cuff & Installation Alignment Mark
Courtesy of GENERAL MOTORS CORP.

17. From the technicians point of view, the FRONT of the sensor will have:
 - A pin hole (2) for the centering pin-Note the location of the pin hole.
 - A flush rotor flange cuff (4)
 - An alignment mark (3) for installation
18. From the technicians point of view, the BACK of the sensor will have an alignment tab

(1) for installation. This sensor does not have double D flats.

IMPORTANT: If reusing the existing sensor, you must align the marks on the flush rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly. If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

19. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.
20. Install the connector to the sensor.

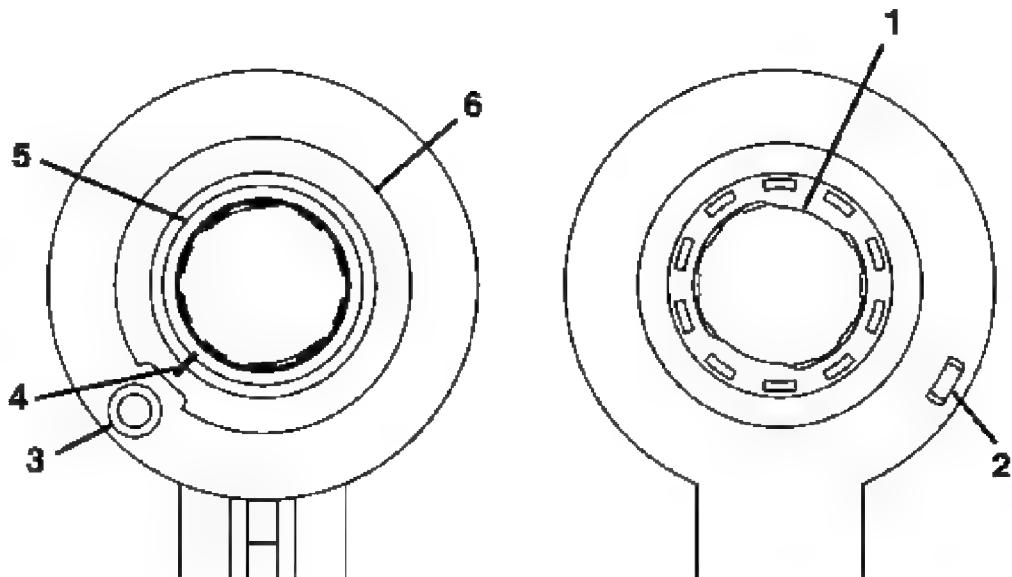


Fig. 128: Identifying Steering Wheel Position Sensor Double D Flats
Courtesy of GENERAL MOTORS CORP.

21. From the technicians point of view, the FRONT of the sensor will have:
 - A pin hole (3) for the centering pin-Note location of the pin hole.
 - A flush rotor flange cuff (5)
 - An alignment mark (4) for installation

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- A foam ring (6)

22. From the technicians point of view, the BACK of the sensor will have:

- Double D flats (1)
- An alignment tab (2) for installing into the adapter and bearing assembly

IMPORTANT: If reusing the existing sensor, you must align the marks on the flush rotor flange cuff before installation. The alignment mark must stay aligned until the sensor is seated into the adapter and bearing assembly.

If installing a new sensor, it will come with a pin installed in the sensor. Do not remove the pin until the sensor is seated. If the new sensor did not come with a pin installed, you must reorder a new sensor.

23. Looking at the FRONT of the sensor, align the sensor with the steering shaft and install into the adapter and bearing assembly.

24. Install the connector to the sensor.

INFLATABLE RESTRAINT STEERING WHEEL MODULE COIL CENTERING

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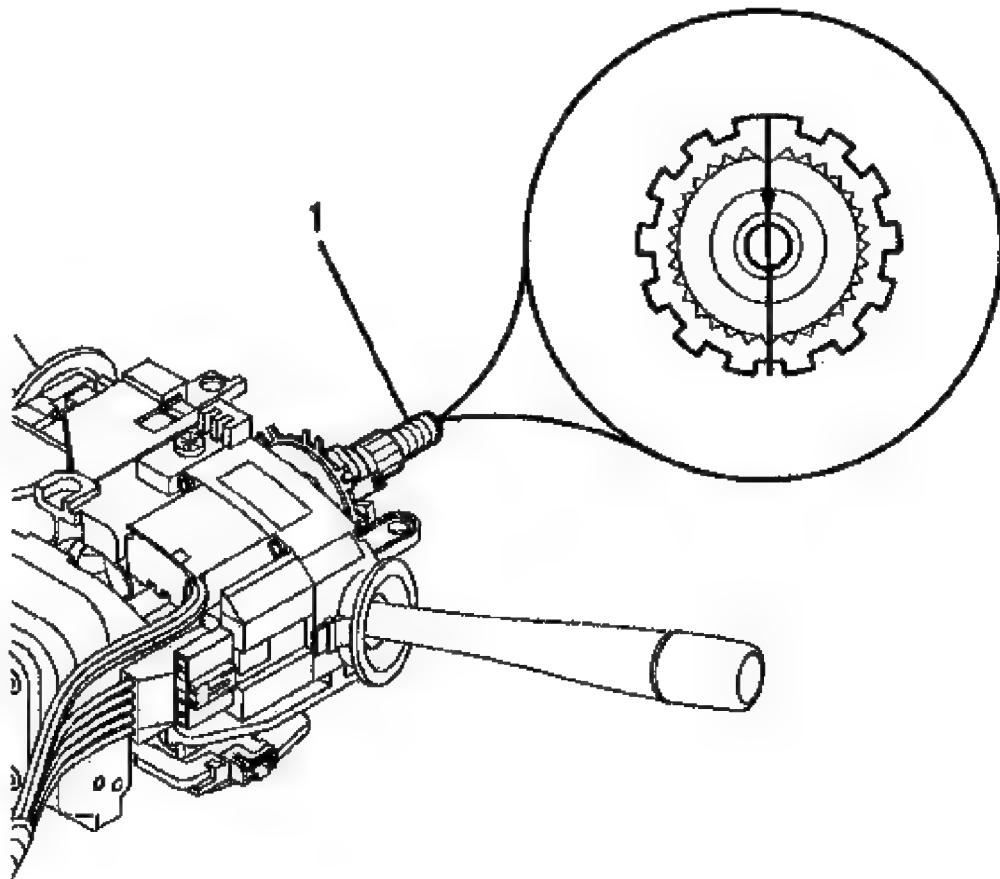


Fig. 129: View Of Block Tooth Of Steering Shaft Assembly In 12 O'clock Position
Courtesy of GENERAL MOTORS CORP.

NOTE: The new SIR coil assembly will be centered. Improper alignment of the SIR coil assembly may damage the unit, causing an inflatable restraint malfunction.

IMPORTANT: If double wire harness strap is installed onto the wire harness assembly and column, you must reuse the holder for the wire straps during installation.
Remove the wire harness strap(s) where necessary.

1. Verify the following conditions before centering the SIR coil:
 - The wheels on the vehicle are straight ahead.
 - The block tooth (1) of the steering shaft assembly is in the 12 o'clock position.

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- The ignition switch is in the LOCK position.

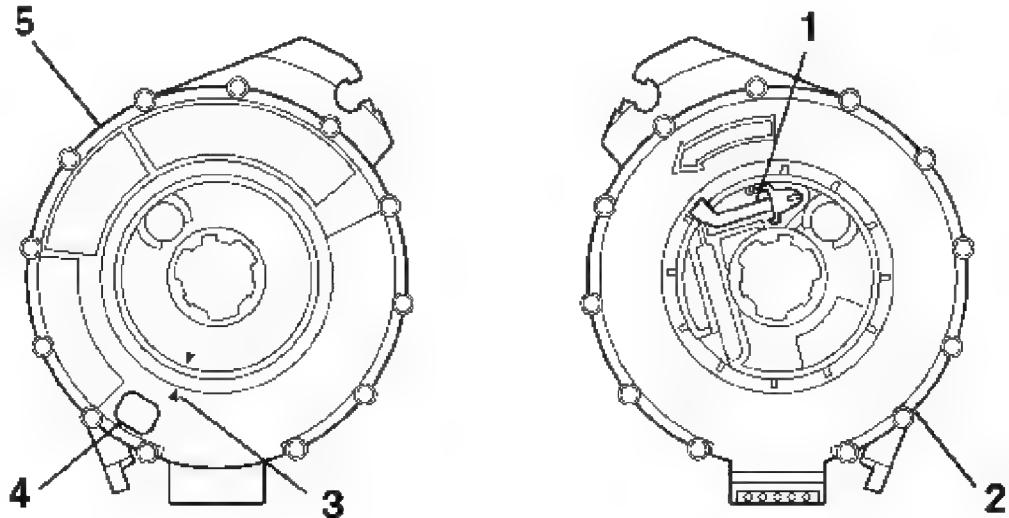


Fig. 130: Centering SIR Coil (With Centering Window & Spring Service Lock)
Courtesy of GENERAL MOTORS CORP.

2. If the front (5) of the SIR coil has a centering window (4) and the back side (2) includes a spring service lock (1), perform the following steps:
 1. Hold the SIR coil with the face up.
 2. While depressing the spring service lock, rotate the coil hub clockwise until the coil ribbon stops.
 3. Rotate the coil hub slowly, counterclockwise, until the centering window appears yellow and both arrows (3) line up.
 4. Release spring service lock between the locking tab. The SIR coil is now centered.
 5. Align the centered SIR coil with the horn tower and slide onto the steering shaft assembly.

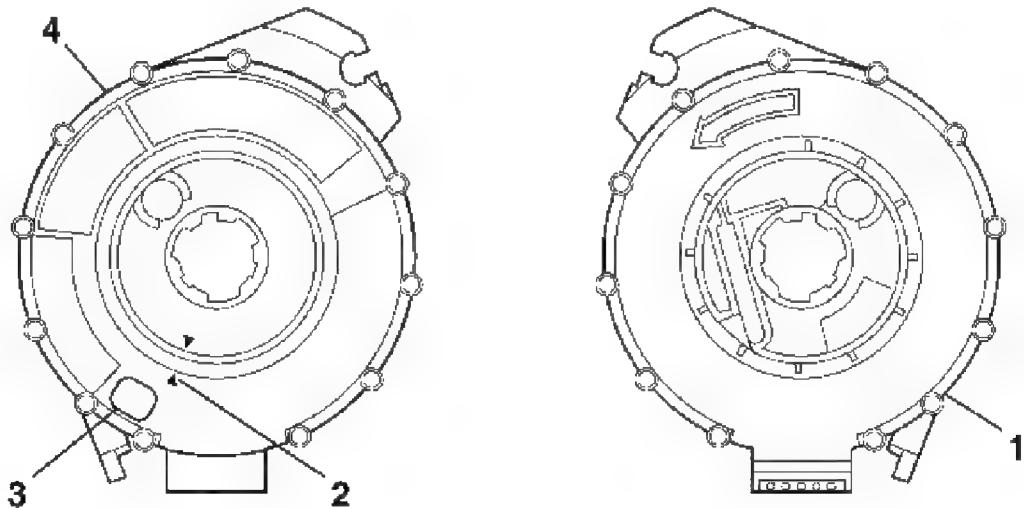


Fig. 131: Centering SIR Coil (With Centering Window, Without Spring Service Lock)

Courtesy of GENERAL MOTORS CORP.

3. If the front (4) of the SIR coil has a centering window (3) and the back side (1) includes NO spring service lock, perform the following steps:
 1. Hold the SIR coil with the face up.
 2. Rotate the coil hub clockwise until the coil ribbon stops.
 3. Rotate the coil hub slowly, counterclockwise until the centering window appears yellow and both arrows (2) line up. This is the CENTER position.
 4. While holding the coil hub in the CENTER position, align the SIR coil with the horn tower and slide onto the steering shaft assembly.

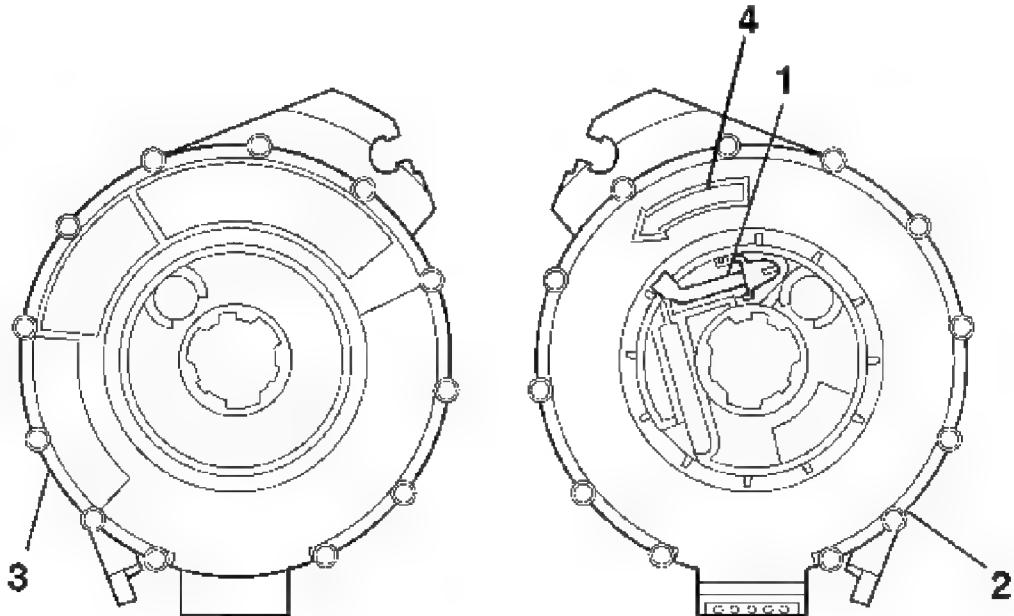


Fig. 132: Centering SIR Coil (No Centering Window, But Back Side Includes A Spring Service Lock)

Courtesy of GENERAL MOTORS CORP.

4. If the front side (3) of the SIR coil has NO centering window, but the back side (2) includes a spring service lock (1), perform the following steps:
 1. Hold the SIR coil with the back side up.
 2. While depressing the spring service lock, rotate the coil hub in the direction of the arrow (4) until the coil ribbon stops.
 3. Still pressing the spring service lock, rotate the coil hub in the opposite direction 2 1/2 revolutions.
 4. Release the spring service lock between locking tabs. The SIR coil is now centered.
 5. Align the centered SIR coil with the horn tower and slide onto the steering shaft assembly.

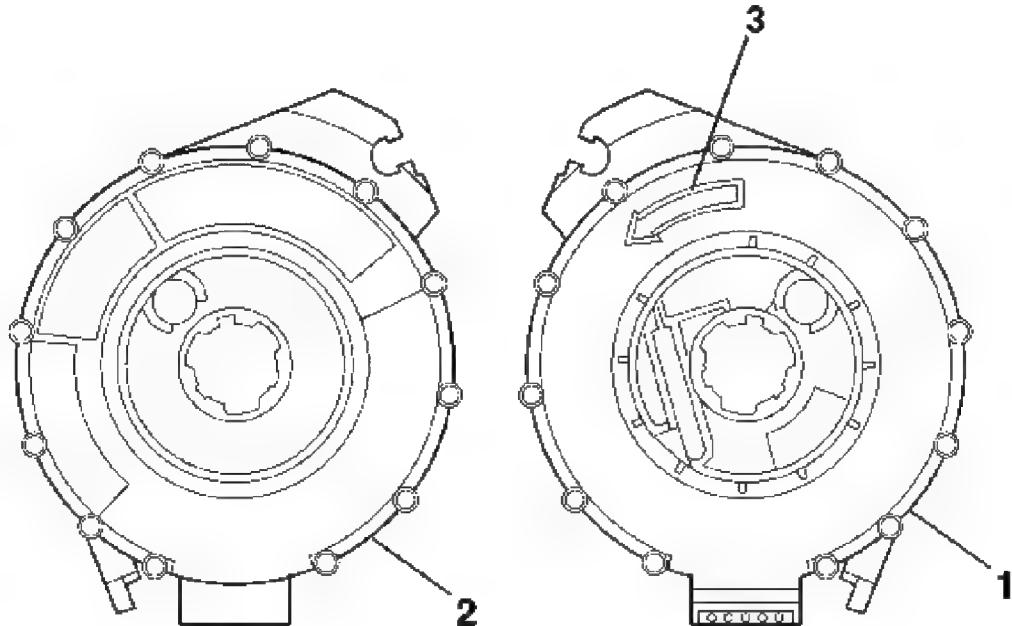


Fig. 133: Centering SIR Coil (Without Centering Window, Without Spring Service Lock)

Courtesy of GENERAL MOTORS CORP.

5. If the front side (2) of the SIR coil has NO centering window and the back side (1) includes NO spring service lock, perform the following steps:
 1. Hold the SIR coil with the face up.
 2. Rotate the coil hub in the direction of the arrow until the coil ribbon stops.
 3. Rotate the coil hub, slowly, counterclockwise, for 2 1/2 revolutions. This is the CENTER position.
 4. While maintaining the coil hub in the CENTER position, align the centered SIR coil with the horn tower and slide onto the steering shaft assembly.
6. If double wire harness strap is installed onto the wire harness assembly and column, you must route the wires up against the steering column. One wire harness strap will surround one lead from the coil to the steering column. The other wire harness strap will surround all leads to the steering column.

DESCRIPTION AND OPERATION

STEERING WHEEL CONTROLS DESCRIPTION AND OPERATION

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2006 STEERING Steering Wheel and Column - Lucerne

The steering wheel control switches duplicate the function of the primary controls of the associated component, through a network of multiple momentary contact switches and a series of resistors. The body control module (BCM) supplies voltage to the switches and monitors the return signal for when a switch is pressed, a specific voltage drop occurs. The BCM identifies the one selected, then sends a serial data message that is received by the component controlled, activating the feature.

This article is intended to diagnosis the circuits between the BCM and the steering wheel control switches. If the primary control for the device is inoperative, refer to the appropriate information for the component the steering wheel control switch is functioning.

STEERING WHEEL AND COLUMN DESCRIPTION AND OPERATION

The steering wheel and column has 4 primary functions:

- Vehicle steering
- Vehicle security
- Driver convenience
- Driver safety

Vehicle Steering

The steering wheel is the first link between the driver and the vehicle. The steering wheel is fastened to a steering shaft within the column. At the lower end of the column, the intermediate shaft connects the column to the steering gear.

Vehicle Security, Found on Some Vehicle Models

Theft deterrent components are mounted and designed into the steering column. The following components allow the column to be locked in order to minimize theft:

- The ignition switch-location varies
- The steering column lock-content varies
- The ignition cylinder-location varies
- The theft deterrent module-location varies

Driver Convenience

The steering wheel and column may also have driver controls attached for convenience and comfort. The following controls may be mounted on or near the steering wheel or column.

- The turn signal switch
- The hazard switch

- The headlamp dimmer switch
- The wiper/washer switch
- The horn pad/cruise control switch
- The redundant radio/entertainment system controls
- The manual/power tilt or tilt/telescoping functions
- The power pedal adjustment control switch
- The navigation/OnStar® features
- The HVAC controls

Driver Safety

The steering wheel and column has safety features to protect the driver. The following components may be mounted on or near the steering column:

Energy-Absorbing Steering Column

The energy-absorbing steering column compresses in the event of a front-end collision, which reduces the chance of injury to the driver. The energy-absorbing feature, collapsible steering shaft and break away mounting features help reduce the injury in the event of an accident. In addition to these features, the following driver safety features may be on the steering column. To inspect the steering column for damage, refer to **Steering Column Accident Damage Inspection.**

Electronic Park Lock (EPL)/Ignition Lock Cylinder Control Actuator

If the vehicle is equipped with automatic transmission and a floor mounted console gear shift, it has an ignition lock cylinder control actuator system in the steering column. The ignition lock cylinder control actuator purpose is to prevent the ignition key from being turned to the OFF position when the transmission is in any position other than PARK and the vehicle may still be moving. The column ignition lock system consists of an ignition lock cylinder control actuator and a park position switch that is located in the automatic transmission shift lock control switch. The ignition lock cylinder control actuator contains a pin that is spring loaded to mechanically prevent the ignition key cylinder from being turned to the lock position when the vehicle transmission is not in the PARK position. If vehicle power is lost, and/or the transmission is not in the PARK position the operator will not be able to turn the ignition key to the lock position and will not be able to remove the ignition key from the column.

Linear Shift Assembly

If the vehicle is equipped with a column mounted gear shift, it has a linear shift assembly on the steering column. The linear shift assembly has a cable that runs from the linear

shift assembly to the ignition lock cylinder case. The purpose of this cable is to prevent the ignition key from being turned to the OFF position when the transmission is in gear and the vehicle may still be moving. The linear shift assembly cable contains a pin that is spring loaded to mechanically prevent the ignition key cylinder from being turned to the lock position when the vehicle transmission is not in the PARK position. If vehicle power is lost, and/or the transmission is not in the PARK position the operator will not be able to turn the ignition key to the lock position and will not be able to remove the ignition key from the column.

SIR Coil and Module

For additional information on the operation of the SIR coil and module, refer to [**SIR System Description and Operation**](#).

Automatic Transmission Shift Lock Actuator

The automatic transmission shift lock control system is a safety device that prevents an inadvertent shift out of PARK when the engine is running. The driver must press the brake pedal before moving the shift lever out of the PARK position. The system consists of the following components: the automatic transmission shift lock control solenoid, the automatic transmission shift lock control switch, the body control module (BCM), the powertrain control module (PCM)/engine control module (ECM). With the ignition in the ON position, voltage is supplied to automatic transmission shift lock control switch. Voltage flows through the normally closed contacts of the automatic transmission shift lock control switch to the automatic transmission shift lock control solenoid. When the BCM receives a class 2 message from the PCM/ECM indicating the transmission is in the park position the BCM then grounds the automatic transmission shift lock solenoid control circuit. This energizes the automatic transmission shift lock control solenoid causing the transmission shift lever to be physically locked in the PARK position. When the brake pedal is pressed the contacts in the automatic transmission shift lock control switch open, de-energizing the automatic transmission shift lock control solenoid. This allows the shift lever to be move out of the PARK position.

Steering Wheel Angle Sensor or Steering Wheel Position Sensor

The steering wheel position sensor is located somewhere along the steering shaft assembly. The sensor measures the position of the steering wheel and the speed at which it is rotated. A signal representing this measurement is provided to the vehicle stability enhancement system (VSES) module. The VSES module uses this signal, along with several others representing different vehicle conditions, to monitor the driving behavior of the vehicle and ensure that it stays in control. If the VSES module determines that the vehicle is out of control it provides signals to the powertrain control module (PCM) and the ABS module. These output signals are used to modulate the transmission torque and brake pressure of each of the vehicles wheels in order to regain control of the vehicle.

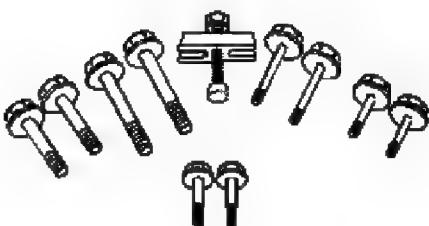
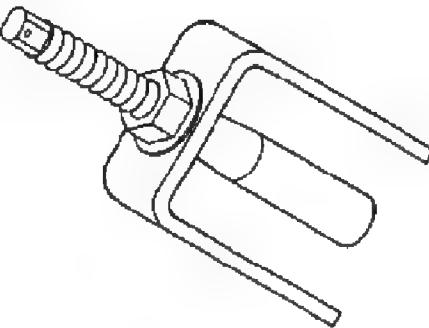
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SPECIAL TOOLS AND EQUIPMENT

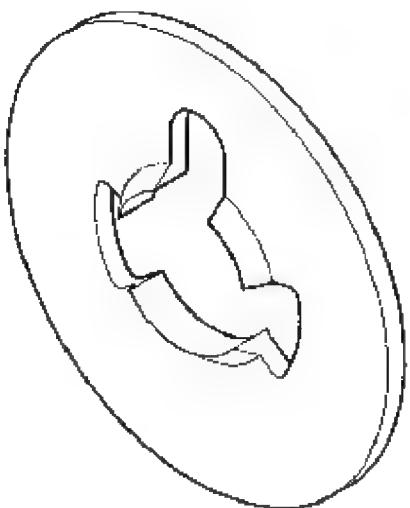
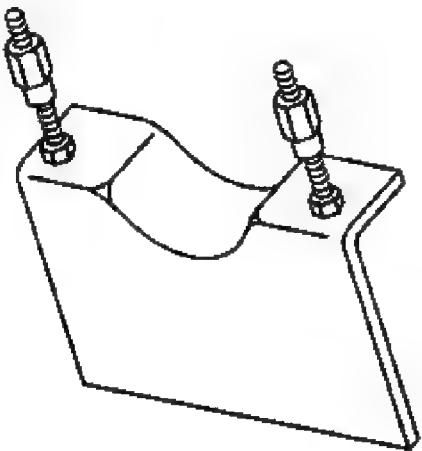
SPECIAL TOOLS

Special Tools

Illustration	Tool Number/Description
	<p>J 1859-A Steering Wheel Puller</p>
	<p>J 23653-SIR Steering Column Lock Plate Compressor</p>
	<p>J 41352 Modular Column Holding Fixture</p>

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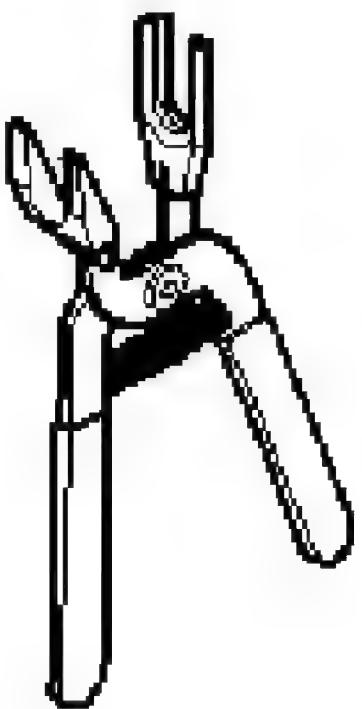


J 42137

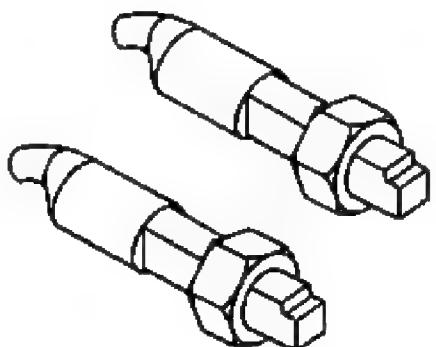
Steering Column Lock Plate Compressor
Adapter

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J 41396
Park Lock Cable Pliers



J 42578
Steering Wheel Puller Legs

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J 42640
Steering Column Lock Pin

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